The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIV, No. 25 CHICAGO December 3, 1921

Published every other Saturday by

TRADEPRESS PUBLISHING CORP.
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
N. C. Rockwood, Vice-President.
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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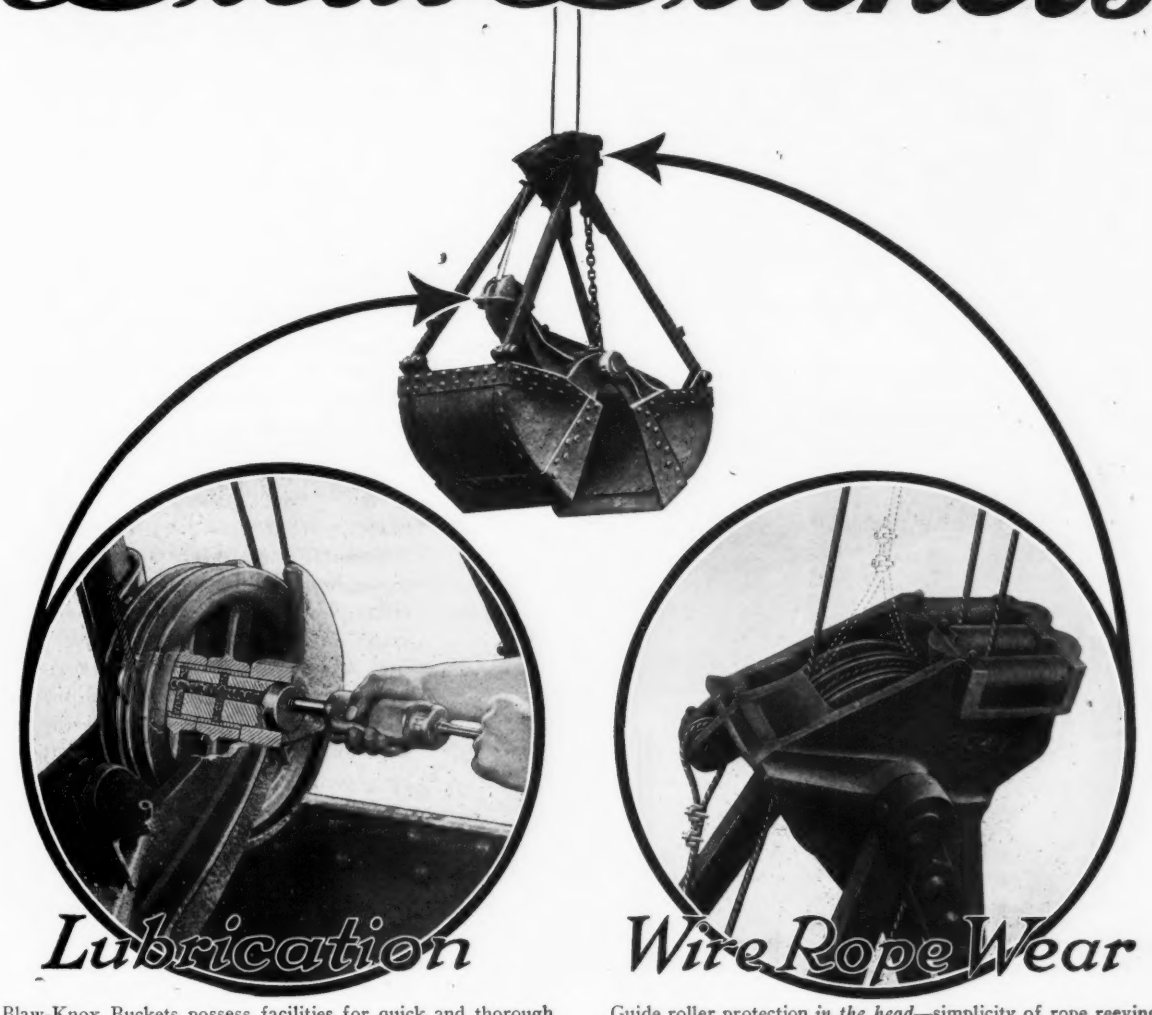
Blaw Buckets



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Blaw-Knox Buckets possess facilities for quick and thorough lubrication.

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Simplified reeving—yet providing high closing power for hard digging materials and extremely quick operation for rapid rehandling. Provisions are made for varying the reeving to take care of different classes of work.

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VOL. I December 3, 1921 Number 7

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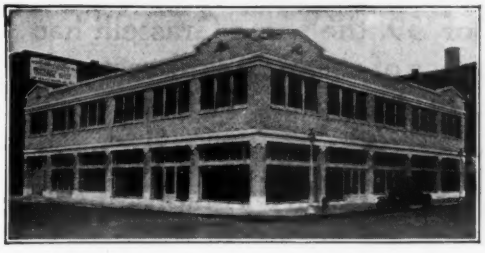

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If you have waste screenings, slag, or sand and gravel, you are the logical producer of these bricks, because you can produce a brick that is admittedly a quality product, beautiful in design, absolutely waterproof, and even at a higher selling price than the clay product, is more salable.

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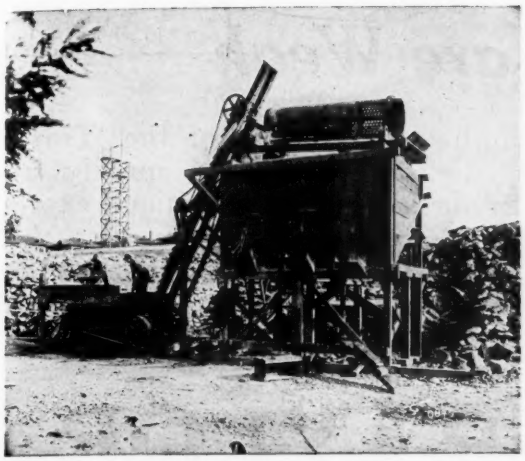
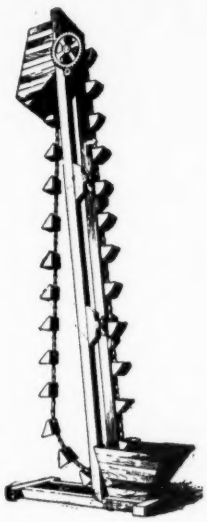
Put the Burden on Jeffrey
Bucket Elevators—You Can't Go Wrong



Road building outfit showing Jeffrey Continuous Bucket Elevator, which carries stone from crusher to revolving screen

Portable outfit for loading bins from ground storage, showing Jeffrey Continuous Bucket mounted on a four-wheel traveling truck



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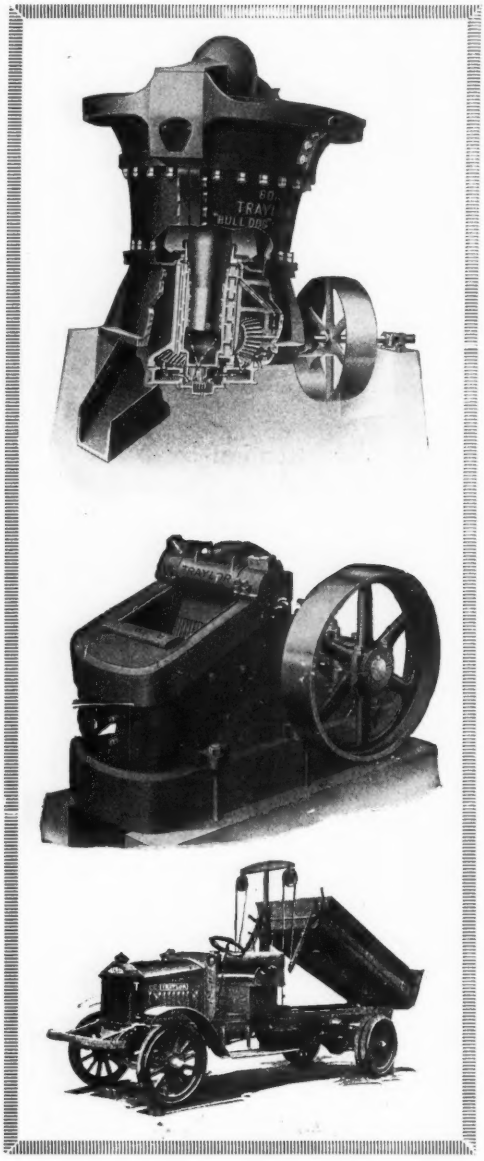

It is in the performance of the Traylor "Bulldog" Crushers that the quality and mighty strength of these machines express themselves. For all practical purposes, their power and strength is unlimited and they maintain an unbroken reputation for low upkeep expense and dependable operation.

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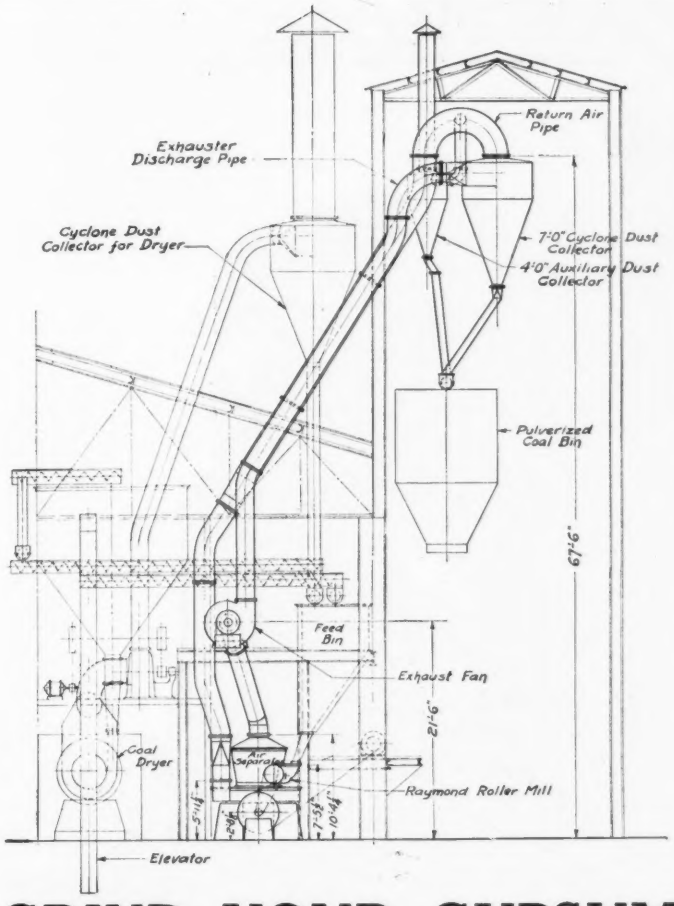

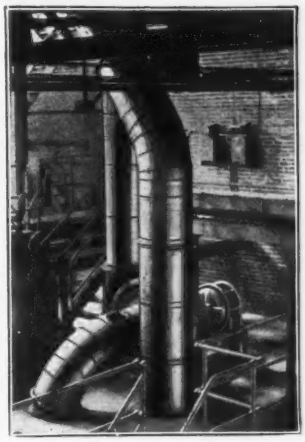

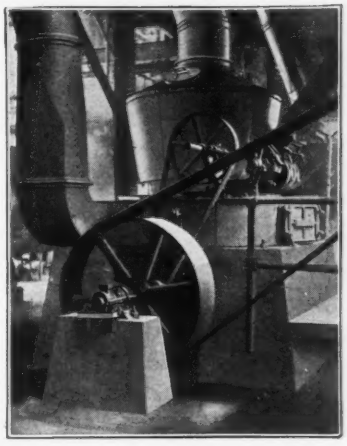

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Rock Products

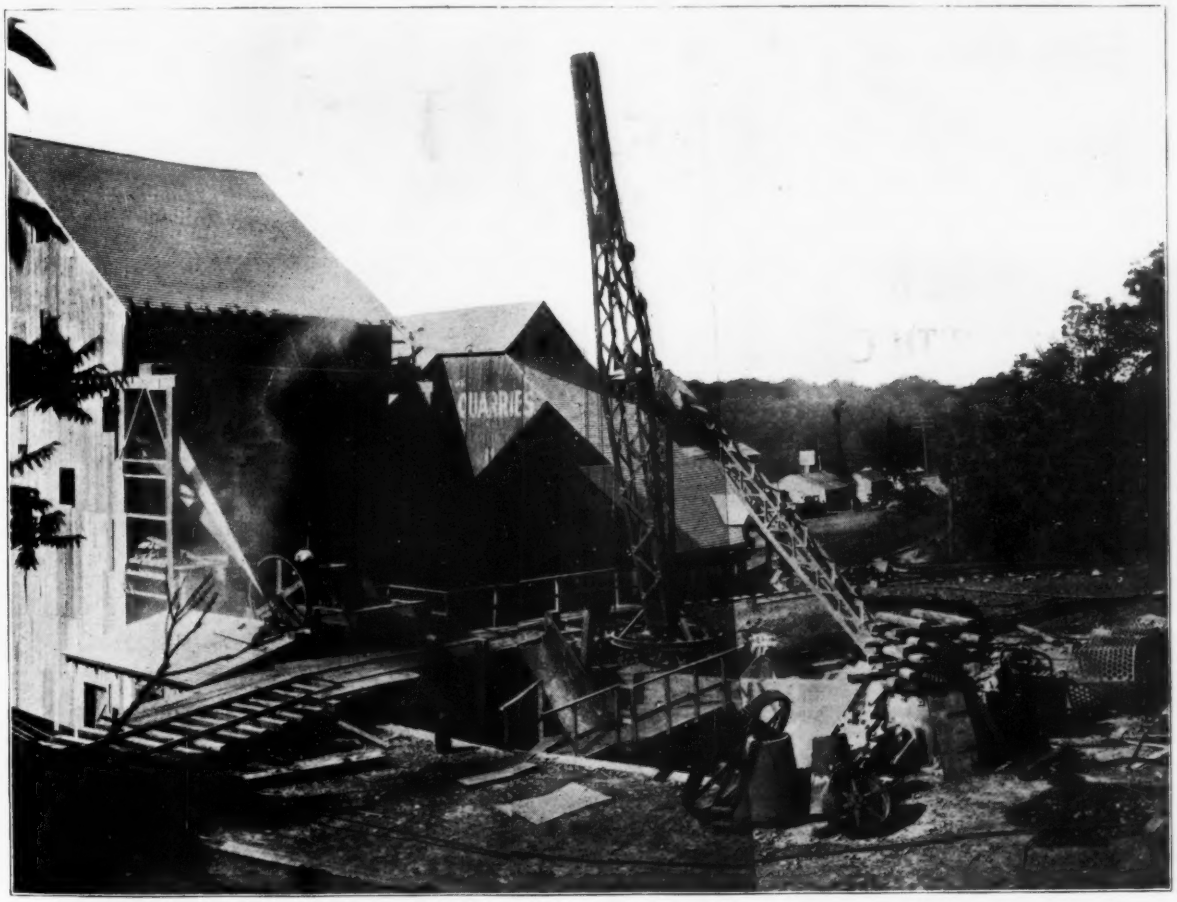
Vol. XXIV Chicago, December 3, 1921 No. 25

Operations of the Connecticut Quarries Company

Six Trap Rock Quarries Serving One of the Most Important Industrial Districts in the Country—Successful Use of Small Revolving Shovels

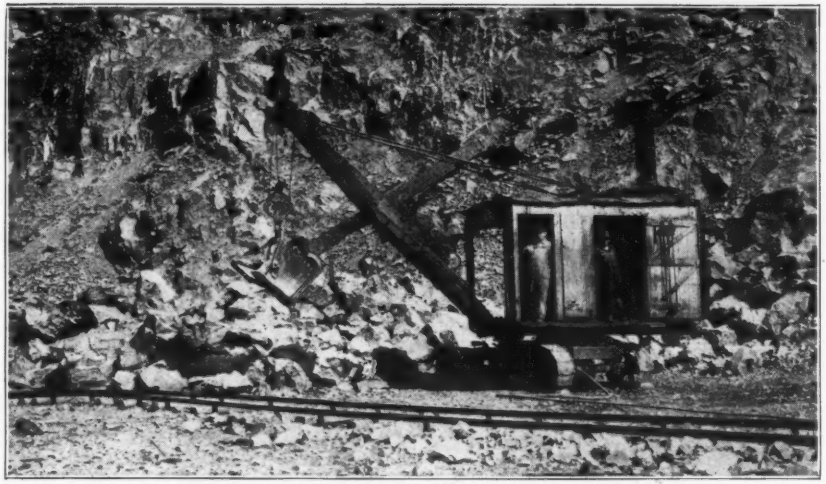
THE MOST EXTENSIVE crushed-stone quarry operations in New England are those of the Connecticut Quarries Co., of New Haven, Conn. These are six trap-rock quarries and crushing plants in a belt between New Haven and Hartford, two of the three largest cities in the state. Bridgeport, the third big city in the state, is 20 miles east of New Haven and is also located within the shipping radius of these quarries.

One of these quarries is served exclusively by an electric railway connection, four exclusively by steam railway connections, while the other one is served by both steam and electric lines. Of course all the plants do a large trucking business. The trolley-car service is most unusual in the fact that the entire district served by the plants is covered by a network of electric railways, all owned and operated by one company—the Connecticut Co.



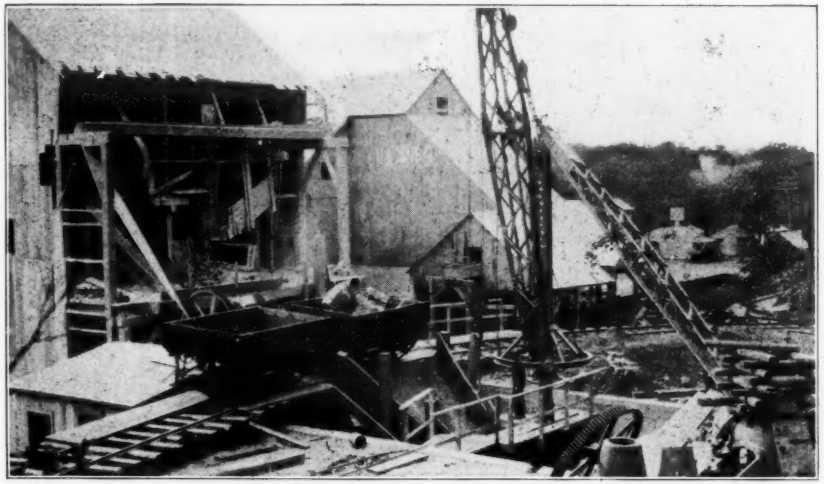
Plainville plant of the Connecticut Quarries Co., showing concrete pit in which new primary breaker is placed

The trolley company has long made



Type of ¾-yd. steam shovel successfully used in all the Connecticut Quarries Co. operations; 18-ton revolving shovels with tractor wheels

Narrow-gauge saddle-tank steam locomotives and contractor-type cars used for quarry transportation system

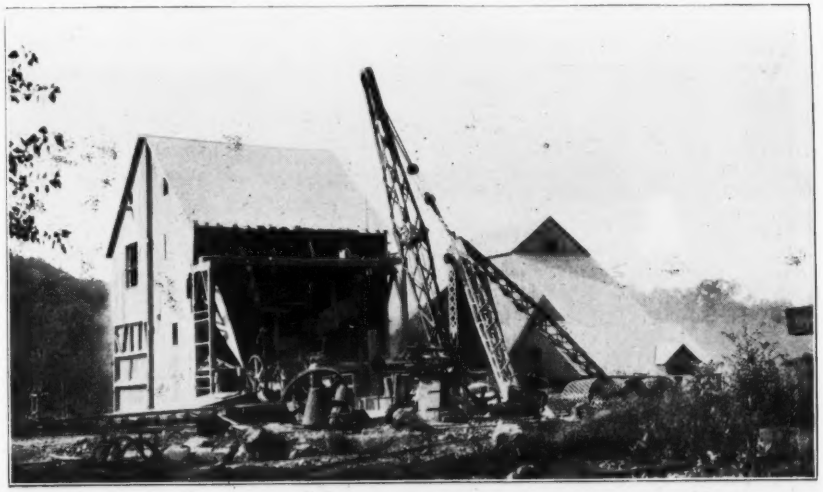


General view showing primary breaker setting at Plainville

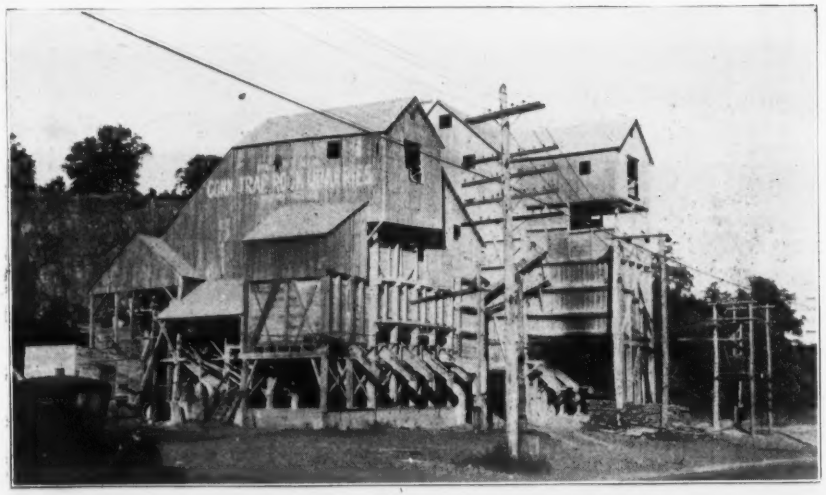
Track layout of crushing plant at Plainville

Truck layout of crushing plant at Plainville

View of the Plainville plant from state highway—office building at extreme right

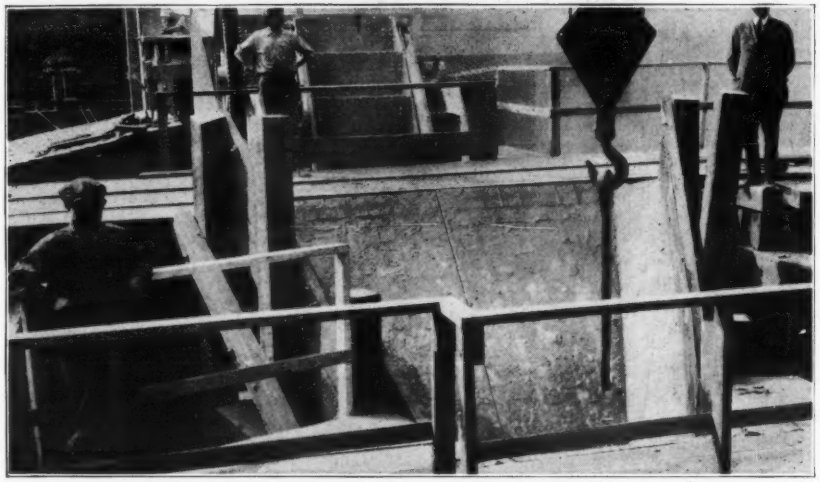


Quarry side of Plainville plant

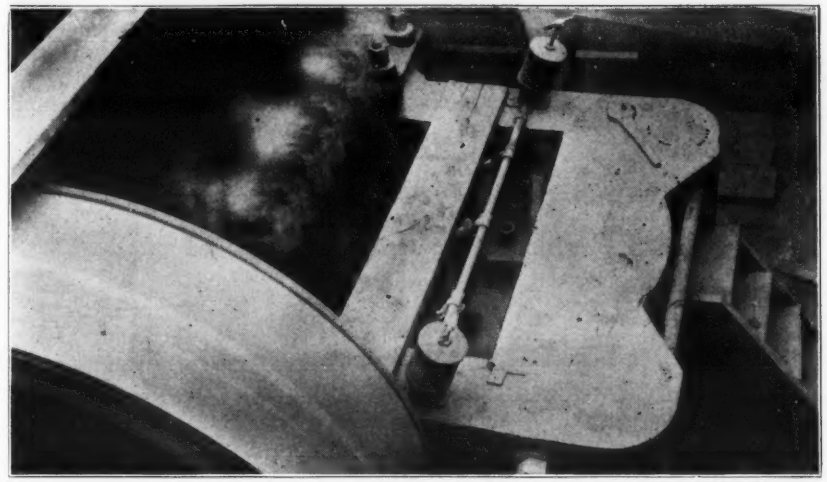


Another view of plant at Plainville showing relation to quarry

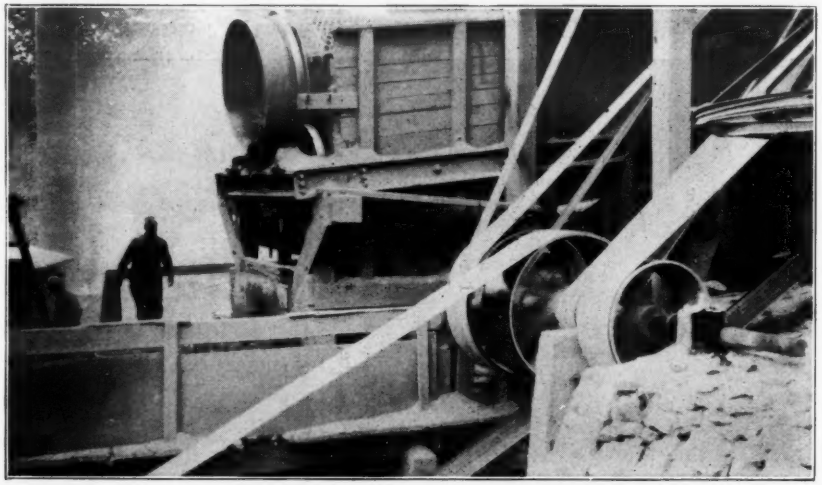
General view of the open-air crushing plant at Mt. Carmel



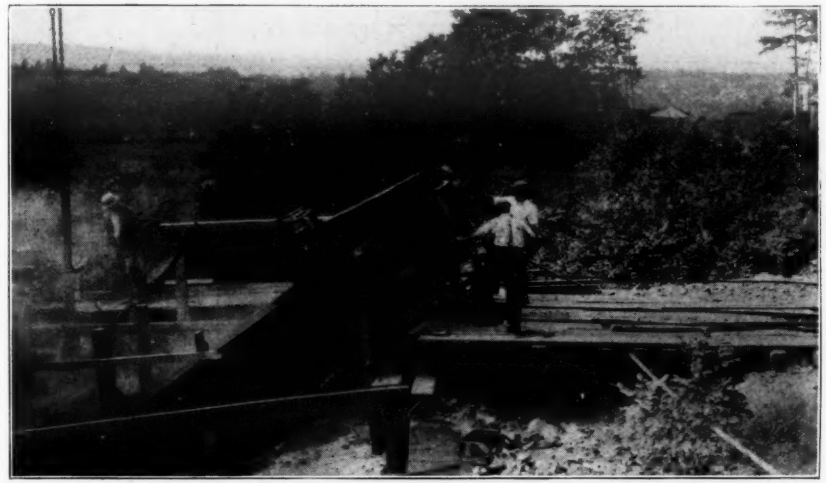
Manganese-steel apron and bridge over crusher at Plainville



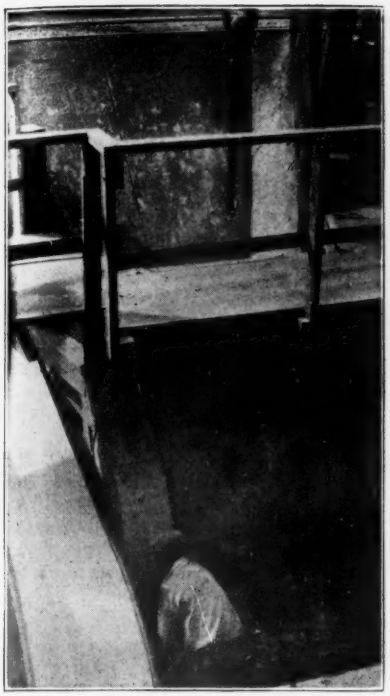
Newest construction, all-steel jaw crusher of extraordinary strength, Plainville plant



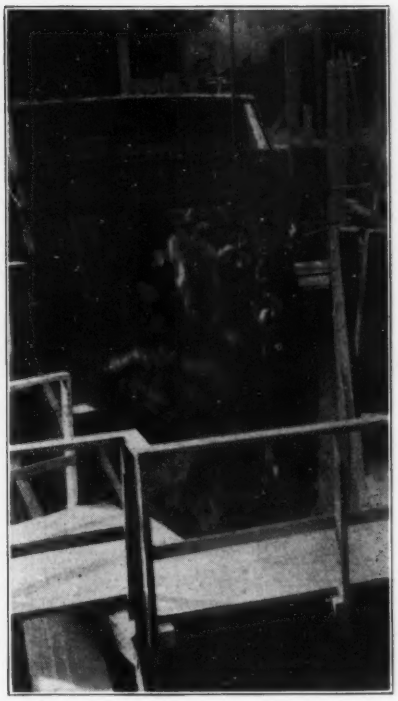
Scalping screen and jackshaft running screen, elevators and new jaw crusher



Type of quarry car used at Mt. Carmel—the only hand-loading operation



Crusher pit with manganese-steel apron at Plainville plant



Dumping into primary breaker at the Plainville plant

crushed-stone traffic more or less of a specialty and provides 30-ton dump cars, especially designed to handle this traffic. These cars operate on regular schedules and put down crushed stone in the cities of New Haven, Bridgeport, Waterbury, etc., in many cases directly on the street where it is to be used. Similarly, since the trolley lines parallel all the main trunk highways, it is possible to ship by trolley direct to the site of many concrete-road jobs.

The quarries are all of similar type, although the character and the "lay" of the stone in each differs considerably. In some of the quarries the rock is in a columnar formation, like the Palisades along the Hudson River, and therefore breaks down very readily. In others, particularly at Plainville, the formation is pretty solid and as hard to break up as in any quarry anywhere. The quarry faces, in nearly every instance, are very high—100 to 300 ft.—which prevents the use of well drills. Consequently the drilling is done mostly with tripod drills and the blasting is done largely in small doses.

Most of the crushing plants have a capacity of about 1,000 tons per day—or a combined capacity of about 6,000 tons. The plants are nearly all old ones, relatively speaking, because the crushed-stone industry itself in this section is older than in most parts of the country. The rugged topography of this section made it possible to design all of them as side-hill operations.

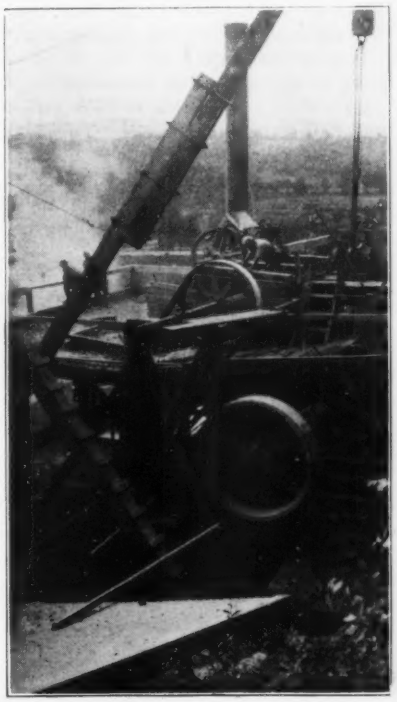
Within the last three years all but one of the quarries have been converted to steam-shovel operations. This was done without any radical changes in the plants, as the main idea was not to increase their capacities but to do the sledging which was previously done by labor. The conversion was accomplished in every case by placing an initial jaw crusher of large size ahead of the older gyratory crushers.

Plainville Plant

A typical installation is that at the Plainville quarry illustrated in some detail in the accompanying views. The original plant consisted of a No. 8 McCulley gyratory, served by an incline track and end-dump quarry cars. To provide for steam-shovel operation a pit was excavated on the quarry side of the plant and a 42x54-in. Buchanan jaw crusher placed as a primary breaker. The 20-ton steel stiff-leg derrick shown in the first view was erected both to place the crusher and to serve it after starting operations.

This crusher is served by trains of side-dump contractor-type narrow-gage cars. The cars dump into a solid manganese-steel chute. A short, rugged, all-steel pan conveyor removes the output of the jaw crusher and serves the No. 8 gyratory. From this crusher the material is elevated to a 60-in. x 20-ft. scalping screen near the top of the plant. The finished sizes go at once to two 48-in. sizing screens, while the rejections are fed to a No. 5 and a No. 6 gyratory.

This improvement, including a new 150-h.p. motor, cost about $ 0,000 and provided an initial crushing unit of about twice the capacity of the rest of the plant. But it was good economy because it permitted two ¾-yd. 18-ton Erie steam shovels to do the work of 40 quarry laborers.



Mt. Carmel plant, new jaw crusher in the foreground

Another view of jaw crusher setting at the Mt. Carmel plant

General view of the quarry at Plainville showing a face 150 ft. high

Good Work of Small Shovels

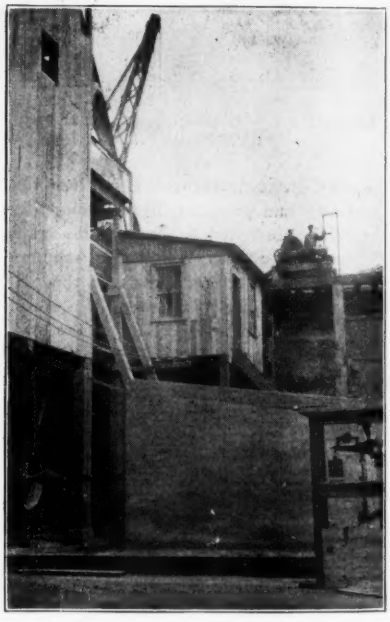
Possibly the most interesting feature of this, and the other similar installations of the company, is the very satisfactory service obtained with these small revolving steam shovels. The duty expected of them is certainly as severe as any shovel is called upon to perform; and it has been generally assumed that light shovels were not as satisfactory for quarry work as the heavier ones. This company, however, has used shovels of this type for over five years and no extraordinary repairs are reported.

Plug-holing boulders after a blast

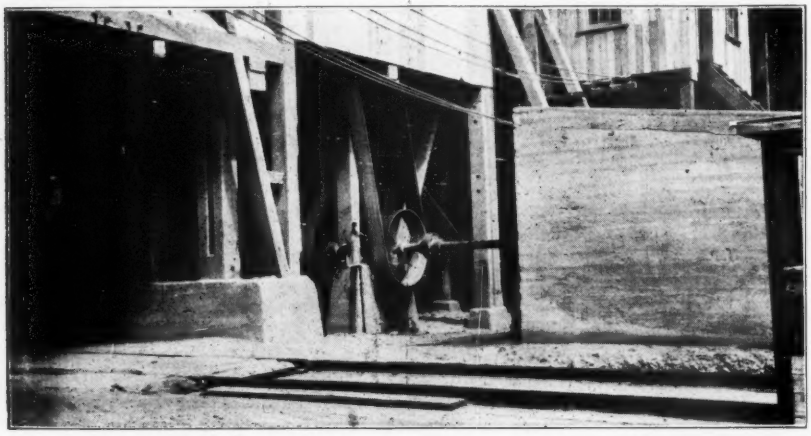
Illustrating the toughness of the Plainville trap rock

At the Plainville quarry, as well as at other quarries where it has been possible, the track serving the primary breaker has been laid in the form of a closed circuit, so that the trains dump and go on past the crusher, instead of having to return over the same tracks. To accomplish this at Plainville it was necessary to make quite a cut especially for the railway approach, but the economy of an operation of this kind had long been proved.

The Plainville plant really consists of two old plants side by side. At present only one is operated. A single 250-h.p. motor drives all the machinery in the crushing plant (except the primary crusher) and an air compressor which operates the hoist engine on the derrick and the drills.



Track scale and concrete motor and compressor house at Plainville



Main shaft connection with electric motor driving the Plainville screening plant

Mt. Carmel Plant

The Mt. Carmel plant has already been described in a past issue of Rock Products. Since then, however, its capacity has been nearly doubled by the addition of a 30x42-in. jaw crusher. The interesting feature of this installation is the fact that addition of the new crusher was accomplished in so simple a manner. The only addition to the power plant consisted of placing a couple of new pulleys on the jackshaft, from which the scalping screen and elevator of the original gyra-

tory primary crusher were already driven. The 250-h.p. high-speed steam engine used for power at this plant assumed the extra load without a shiver.

B. D. Pierce, Jr., of Bridgeport, Conn., is president of the Connecticut Quarries Co.; Albert L. Worthen is vice-president in general charge of operations; Arthur S. Lane is treasurer, and Irving S. Tinker is secretary. The general offices of the Connecticut Quarries Co. are in New Haven. The plants are located at Middlefield, Meriden, Rocky Hill, Plainville (two) and Mount Carmel, Conn.

Uses and Sources of White Clay

English and American Production of Kaolin

By Kirby Thomas

THE LARGEST consumption of white clay, a kaolin, is in the paper business, particularly as a filler in book and magazine paper, and as a coating material for the glazed and coated papers. The average percentage filled in ordinary book paper is about 20 per cent. It is also used to some extent as a filler in newsprint paper. It is estimated that the annual growth of consumption in the paper industry is about 8 per cent. There is also a consumption of some 20,000 to 25,000 tons of clay annually in the wall paper business for coating wall paper, and an equal consumption in the paint industry as a filler and extender in paint and kalsomine. Its smaller uses are for coating oil cloth and for filling in cotton goods and plaster. During the past two years there has been conducted tests of the use of clay as a rubber compounding material. This rubber clay is used now at the rate of about 3,000 tons a year, and it is expected that by the first of next year it will be on a basis of a car a day or 10,000 tons.

The preparation of white clay or kaolin for the market is a little known industry, which, however, has been steadily developing during the past thirty years. The main source of supply for the world has been England, where at present there is a productive capacity of about one million tons per year, and under normal manufacturing conditions the English producers expect to sell to the United States about 350,000 tons annually.

The American clay industry has heretofore been located in the South, chiefly in Georgia and South Carolina, a long distance from the consuming markets. The producing companies are small and operate independently.

English clay is selling at present at about $12 per ton f.o.b. seaboard. It is believed that $10 per ton will be the lowest competitive price to be met for years to come. The lowest price at which English clay has sold in the past ten years is about $8 per ton f.o.b. seaboard, at a time when labor and coal were costing abroad less than one-quarter of the present cost.

The duty on English clay is $1.25 per ton, which is half the rate in the Payne-Aldridge tariff, and it is believed that the $2.50 rate will be restored in the new tariff which is under consideration, with a very strong probability that it will be put at a higher figure. Sterling exchange rates are gradually rising, thus increasing the price of English clay.

The production figures for England and the United States are as follows:

American Clay (Tons of 2000 Lbs.)

	Georgia	South Carolina
1908	18,240	26,231
1909	31,617	31,856
1910	36,571	29,051
1911	45,076	30,640
1912	48,482	44,372
1913	69,740	31,568
1914	62,298	27,906
1915	67,752	24,688
1916	92,671	32,556
1917	109,222	40,173
1918	76,073	39,041
1919	75,000	34,000
1920 (estimated)	90,000	40,000

In 1920 Virginia produced 10,000 tons.

English Clay Imports (Tons of 2240 Lbs.)

1908	176,895
1909	246,381
1910	257,902
1911	255,107
1912	278,276
1913	268,666
1914	328,038
1915	209,132
1916	253,707
1917	241,029
1918	168,100
1919	180,000
1920 (estimated)	300,000

Progress in Oil Shale Development

OIL SHALE deposits are world-wide in extent and interest in them is almost universal, writes Victor C. Alderson, president of the Colorado School of Mines. As information is general as to the deposits in the United States, Great Britain and France, Professor Alderson has confined himself to the new deposits found in other countries.

In Italy, the deposits are in five provinces. A company will be formed to distill oil from the Sicilian bituminous shales. Italian engineers treated 5000 metric tons in 1920.

Germany before the war, imported its supply. A corporation, with state and national support, will develop the newly found oil shale deposits.

Spain has these deposits in five provinces, but has not begun operations.

Bulgaria has no wells, but extensive deposits of shale. Five concessions have been granted. Some tests show 13 per cent of oil and 30,000,000 tons of shale.

Norway's deposits are closely associated with its coal deposits. In Sweden a company is treating 100 tons daily and is getting an excellent fuel oil.

The new Russian government has so developed this industry that in Esthonia the oil shale is more varied and successful than anywhere else in the world, not excepting Scotland. At the government mines at Kochtel in 1920 there were 50,000 tons produced and 500 men employed.

Brazil, depending at present upon foreign sources for fuel, has discovered oil shale in abundance, in one case the shale yields 44.73 gal. to the ton. Argentine has one deposit 1½ miles back of the out-crop with an average thickness of 100 ft.

In South Africa the oil shale is well defined in four areas—Ermelo and Wakkerstroom, in the Transvaal; Utrecht and Impendhle, Natal. The actual value of the field is but little known as only a small amount of prospecting has been done. An early development is expected.

Australia's best known deposits are in New South Wales. The "kerosene shales" yield a very high percentage of volatile hydrocarbons. The total production 1865-1919 was 1,840,876 tons.

In Canada the Saskatchewan province should yield as high as 123.2 gal. to the ton. The potential value of Newfoundland oil shale is immense; the deposits have an area of 750 sq. miles; the average shale yields 50 gal. of crude oil and 80 lb. of ammonium sulphate. At Pictou, N. S., the area is 10 sq. miles having 500,000,000 tons of available shale.

A comprehensive, world-wide view of the situation, says Professor Alderson, suggests these facts:

The supply of well petroleum cannot be depended upon to supply indefinitely the needs of industry and an advancing civilization for oil and its derivatives; oil shale deposits are inexhaustible.

The main problems to be solved are: The perfection of a retort of large capacity, designed on correct scientific principles, that will produce the maximum amount of good oil; refining the crude shale oil into a few standard market products; co-ordination of the various elements so that as a business project the whole will be an economic success.

Hints and Helps for Superintendents

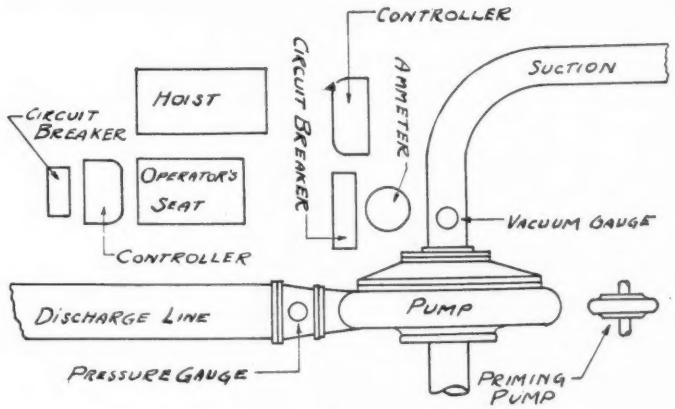
Controller Arrangement on Sand Dredging Barge

ARRANGEMENT of controls and the placing of machinery in logical order is one of great importance on hydraulic sand and gravel dredging barges. Herewith are several illustrations of the dredge of the Hahn-Muscatine Co., Muscatine, Ia., showing the logical arrangement of machinery and controls so that only one man is necessary for the entire operation.

The operator is so placed that immediately behind him is the controller and circuit-breaker governing the operation of the hoist which raises or lowers the suction nozzle. The hoist is to the left of the operator and so placed that he can readily control it with his left hand and left foot. In front of him is the controller and circuit-breaker governing the operation of a 12-in. centrifugal pump belt-connected to a 150-hp. motor. Just above the circuit breaker is an ammeter and directly to the left of it is the vacuum gage which is readily seen from the operator's position. To the right of the operator is the pressure gauge and a check valve on the discharge line from the pump. Thus from one position the operator has access to all the controls on the dredge.

Arrangement of machinery on barge

Position of operator in relation to control



Layout of controls and machinery

Figuring Belt Conveyors

ONE of the most efficient and economical methods employed for handling material in bulk is by belt conveyor, according to A. M. Oliver, writing in the *Engineering and Mining Journal.*

The installation cost as well as the depreciation on the belt itself, leaving the rest of the equipment out of consideration, is a most appreciable item. The cost of the belt has been found to range from 40 to 60 per cent of the cost of the total equipment, depending upon its width and length. The maintenance charge is estimated to be as high as 33⅓ per cent. Abrasive wear, due to slippage or sliding of the material on the belt, is the chief cause of belt deterioration. As the belt carries its load a constant readjustment of the lumps takes place, thus gradually wearing out the rubber cover on the belt. Naturally, the property of the carrying surface of the belt, the rubber cover, is an important factor.

A belt with a hard, highly vulcanized cover increases the tendency of the material to slide on its surface; one with a comparatively soft and resilient cover is to be preferred. After the cover is exposed to the air for some time it becomes hard if not compounded properly. Cheap belts soon "bloom" after being exposed to the air; that is, the belt assumes a white color, certain ingredients crystallize on its surface, and those remaining form a hard non-resilient mass. The tendency of the cover to harden is somewhat compensated for by the fact that the surface will become rough, allowing a thin layer of the finer material to adhere, which slightly protects the cover.

Where the material must be conveyed on an incline, the abrasive wear is more pronounced, because the material slides back longitudinally. Preventing excessive wear on the belt of an inclined conveyor due to longitudinal sliding of the load can be accomplished only by limiting the angle of incline of the belt to a few

degrees below the angle of repose of the material handled.

The wear due to the loading of the conveyor is more difficult to prevent. Neither the wear nor its causes can be entirely overcome, but the destruction can be lessened by proper design of loading chutes and by increasing the area of belt over which the load is distributed. If it were possible to deliver the load in the same direction and at the same speed as the belt travels, no wear would occur at the loading points, but such conditions can be only approximately approached and an oblique impact shock is unavoidable when the load strikes the belt. A resilient cover naturally reduces the destructive action of such impact, and to reduce further the shock with which the material strikes the belt, an adjustable curved plate or lip is often attached to the lower edge of the chute, so that the material leaving the chute is deflected in the general direction in which the belt is moving.

Unloading conveyor belts is often accomplished by means of a tripper, a device consisting of three pulleys so arranged that the belt can be unloaded at any point. These trippers increase the wear on the belt because of the added flexing of the belt around its pulleys, as well as the readjustment of the load while passing over the tripper.

Many factors must be taken into consideration when deciding upon a conveyor belt, and it is impossible to determine the type of belt and the thickness of covers from mere book knowledge. There are no formulas for calculating the thickness of cover to resist abrasion; this is something which can be determined only from actual experience. The width and number of plies required to carry the load can be ascertained mathematically. The width of the belt depends principally upon the size of lump of which the material consists. Several rules are used by which the width of the belt may be determined. One of these is as follows:

Four times the average size piece plus 6 in. In other words, if the average lump measures 2 in., the belt must be 14 in. wide. This rule is all right as far as it goes. It must be remembered, however, that the tonnage to be handled, the speed and other details are deciding factors which govern the dimensions of the belt. The foregoing formula simply marks the minimum width permissible to prevent spilling.

The carrying capacity of belt conveyors is given in the table.

Capacities at 100 Ft. Per Minute of Conveyors Handling Material Weighing 100 Lbs. Per Cu. Ft.

Flat Conveyor		Troughed Conveyor	
Width, Inches	Tons per Hour	Width, Inches	Tons per Hour
10	7.6	10	17.6
12	10.8	12	25.2
14	14.8	14	34.4
16	19.2	16	44.8
18	24.4	18	56.8
20	30.0	20	70.0
22	36.4	22	84.8
24	43.2	24	100.8
26	50.8	26	118.4
28	58.8	28	137.2
30	67.2	30	157.6
32	76.8	32	179.2
34	86.8	34	202.4
36	97.2	36	226.8
38	108.4	38	252.8
40	120.0	40	280.0

The tonnage a conveyor belt will handle increases in proportion with the speed of the belt and with the weight of the material. That is to say, if a 20 in. belt handles 30 tons per hour of material weighing 100 lb. per cu. ft., the belt traveling 100 ft. per min., it will convey 120 tons per hour if the material handled weighs 200 lb. per cu. ft. and the belt travels at 200 ft. per min.

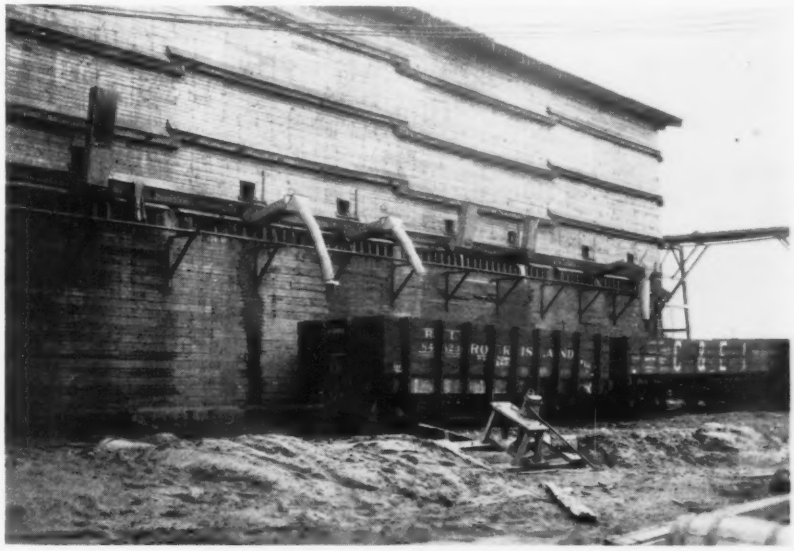
The power required by a belt conveyor is approximately 2.5 h.p. per 100 tons per hour for every 100 ft. of belt. To this must be added the power necessary to lift the material, in case the belt operates on an incline, and the power absorbed by trippers should there be any. The power necessary to lift the load is equal to the tons per hour multiplied by the lift in feet divided by 1000. The total horsepower thus found multiplied by 1500, a constant, and the result divided by the product of the width multiplied by the speed, gives the number of plies necessary. Thus: Number of plies equal hp. multiplied by 1500 divided by width multiplied by feet per minute.

These formulas are derived from basic principles. Other factors peculiar to each case must be given consideration, but the formulas will serve as a guide. It is impossible to deal with this subject in its entirety within the limits of this paper.

Flexible Spouts for Loading

SIDE-BIN LOADING is usually accomplished through side-bin gates and hinged loading chutes. The hinged chutes are counterweighted sufficiently to hold them up against the side of the bin when not in use, so as to permit the cars and engines to pass.

Herewith is possibly a slight improvement over the hinged chute. There is merely added a flexible spout, such as is generally found in grain elevators, to the hinged chute. The flexible spout not only facilitates loading but gives a better distribution of material in the car.



Flexible spouts for loading sand and gravel

How to Carry Swinging Cables

THERE is considerable difference of opinion among dragline operators as to the best method of carrying swinging cables on dragline excavators of the older type which are swung in this manner. The practice among many has been to carry them loose or just tight enough to stay in the sheaves; others claim that this practice results in frequent breakage.

Robert M. Rogers of Chester, Va., one of the experts of the younger generation, advises us that he has always carried them tight and has got fourteen months' continuous service from the last pair which he took off which happened to be ⅞ inch, 6 x 19. We recommend this practice to dragline operators.—*The Excavating Engineer, November, 1921.*

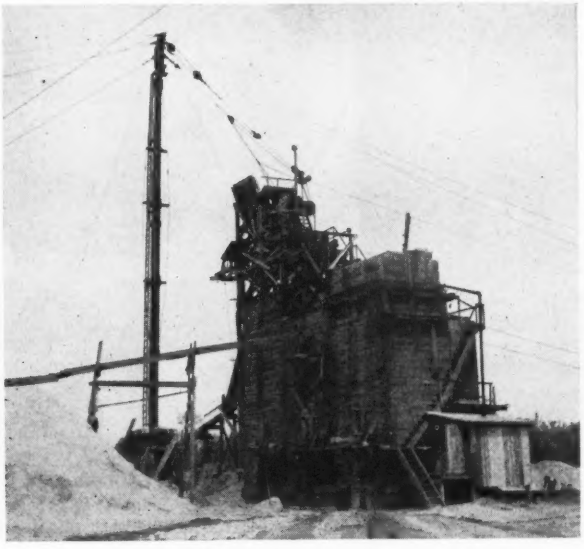
To Superintendents—Send in your suggestions as well as notes on what you have found trouble with and overcome successfully in your operations.

Memphis Sand and Gravel Plant

The Wolf River Sand Company Uses Both Dredge and Dragline Cableway in Excavating Material

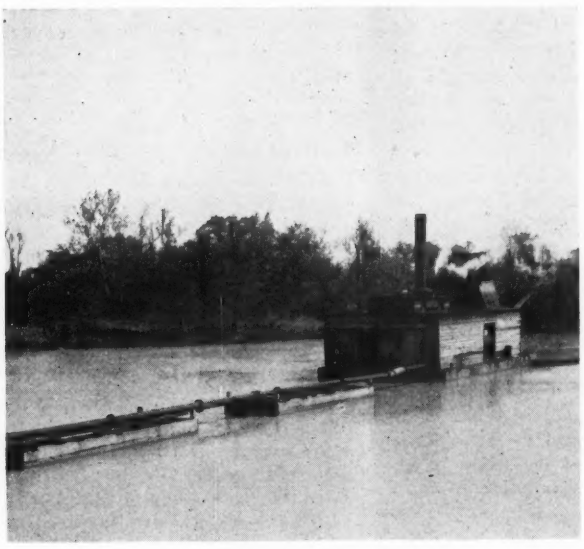
A LARGER appreciation of the factors imparting quality to concrete in the construction industry in the last few years has made a critical consideration of aggregates imperative. The best materials it is possible to secure are now required, for only through the use of clean, adequate materials can proper strength and durability in concrete be obtained. Heretofore, too little attention has been given to clean aggregate. It is now receiving, whenever concrete construction is best understood, the attention it demands.

It is with this idea in mind that the Wolf River Sand Co., of Memphis, Tenn., was launched. The plant and the deposit are located about 2½ miles from Memphis, on the Union Belt Railroad. The present deposit is about six or seven acres in extent and is located on a creek leading from the Wolf river. The deposit has been tested and material has been found to a depth of 60 ft. below the surface of the water.

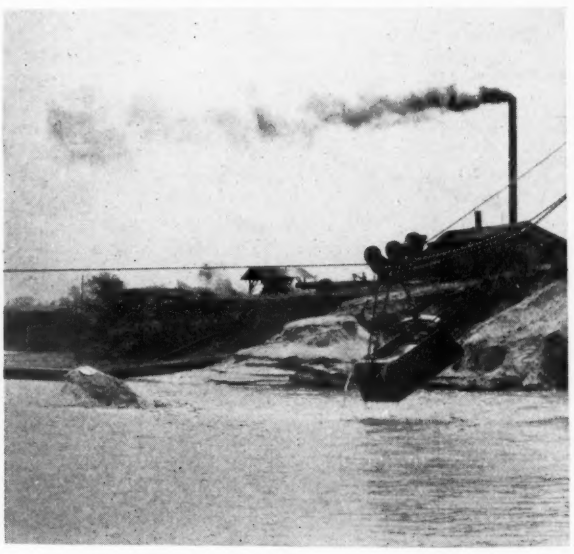


General view of plant

Dredge and dragline cableway excavator



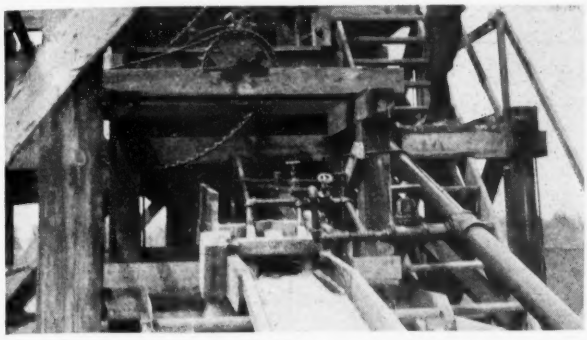
Dredge and pontoons



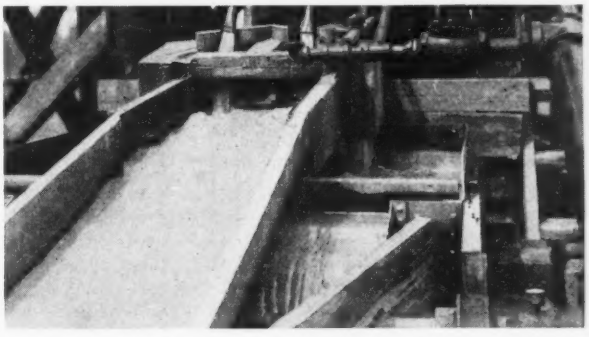
Discharge from dredge and cableway excavator in operation

An unusual feature in this plant is that it uses both a dredge and a dragline cableway excavator to excavate its material. The dredge is used to place the material within reach of the dragline sys-

tem, which hoists it to the top of the plant for sizing and washing. The dredge was formerly used to pump the sand and gravel direct to the receiving hopper at the plant, but difficulty was encountered when blue gumbo clay was struck in the deposit. It was therefore necessary to buy a dragline cableway excavator to mine this particular deposit. The operation proved to be so successful that the company has been operating the dragline in connection with the dredge ever since. The dragline excavator works to a depth of 50 ft.



Material being discharged from screen to flume



Automatic sand settler

The Dredge

The dredge, shown in one of the accompanying illustrations, is equipped with a 12-in. centrifugal pump run by a 250-hp. steam engine. A 250-hp. boiler generates the steam. Two boiler feed pumps serve the boiler and one small pump is used to prime the 12-in. pump. The boiler also generates steam for a 3-ton steam hoist which is used to raise and lower the suction nozzle. The material is discharged into a 12-in. pipe line over a system of pontoons which throws the material within reach of the dragline.

A Sauerman type dragline cableway excavator, with a 1½-cu. yd. bucket, dumps the material into the receiving hopper at the plant, from which it is washed out through a 1-ft. square opening into the first screen. As the material comes out of the gate it goes into a flume where three nozzles of water play on it, thus giving it added velocity for its passage to the first screen.

Washing Plant

The first screen is of the conical type, with 2-in. perforations, manufactured by the Stephenson-Adams Co. Material over 2 in. is regarded as waste and goes to the dump pile, while material under 2 in. goes to the second screen, which is similar to screen No. 1, but has ½-in. perforations. The material over ½ in. and up to 2 in. goes to a bin. This material is sold as concrete aggregate. The material under ½ in. leaves the screen and is washed into a flume containing a small section of flat screen having 3/16-in. perforations.

The material under 3/16 in. falls into a lower flume and is washed into a settling box, where the sand is allowed to settle and the waste water flumed off. This has been explained in the "Hints and Helps for Superintendents" department of Rock Products in the July 2, 1921, issue. Material ¼ in. to 3/16 in. goes to an automatic dewaterer or settling tank, from which it falls into a bin. This is specified as coarse sand, while the material under 3/16 in. is known as fine sand.

The coarse sand is used for concrete purposes, while the fine sand is used as masons' sand, etc. The total capacity of the plant is 700 cu. yds. of material per 8-hour day.

Power

The total power for the plant comes from a 20-hp. steam engine which runs the screens from a rope-drive and also generates enough current for lighting purposes by running a small 50-kw. generator.

The hoist for the dragline cableway excavator is steam driven, of the double cylinder type, with 14-in. drums. A 6-in. double-valve horizontal pump furnishes the water necessary for the washing and screening plant.

Steam for operating all loading equipment is generated by two boilers, one of the vertical type and one of the horizontal, developing 125 and 150 hp., respectively. The vertical boiler is used only in case of emergency.

It has often been stated that sand and gravel plant methods of operation develop by districts, but the Wolf River Sand Co. did not have the benefit of the experience of any predecessors—there were none. The company has worked out its own salvation and believes that the system it now works under is the only one for it.

V. A. Cordes is president of the Wolf River Sand Co.; W. W. Fisher is vice-president; Paul Danman is secretary-treasurer; H. H. Griffith is superintendent, and T. J. Billingsly assistant. The company operates a fleet of three 5-ton trucks for delivering materials to the city of Memphis.

Price Situation Dominant

AT the luncheon given for Secretary Hoover and the executive officers returning from the western trip in Washington, November 19, a general review of conditions as found throughout the West was presented, states the Bulletin of the Associated General Contractors.

One thing only seems to hold the flood-gates closed; it is the fear on the part of the contractor, the banker and the public everywhere that, once the business starts, prices will begin to climb. Wages seem to be seeking a reasonable level and labor efficiency in most cities has returned to normal; but business is bound to go slow, unless there come from authoritative sources positive assurances that material prices are not merely waiting for the demand to become evident in actual contracts in order to take advantage of the situation. Again there is the widespread impression that the difference between the manufacturers' and the retailers' prices is not what it should be. Here, also, there is need for a frank and authoritative disclosure of facts.

Throughout the West, the President's Unemployment Conference has aroused in each city an awareness of the fact that something definite must be done in the present circumstances. Local organizations have been formed and are at work.

Those who attended the luncheon included Secretary Hoover, F. L. Cranford, D. A. Garber, W. A. Rogers, N. F. Hoggson, L. W. Wallace, secretary of the American Federated Engineering Societies; E. E. Hunt, secretary of the President's Unemployment Conference; R. C. Marshall, Jr., G. W. Buchholz, E. J. Harding.

Sand Settling and Sand-Settling Devices

Part II—No. 13—The Application of Classification to Grinding Rock and Ore

By Edmund Shaw
Allen Cone Co., El Paso, Texas

MANY are the uses of classification, as the process enters into the manufacture and preparation of so many substances. But it is probable that, in point of the tonnage handled, the greatest use is in connection with grinding machinery, where it is used to separate the sufficiently ground material from that which needs further grinding.

As an example of the great tonnages which are treated in this way, we mention one mill treating copper ore, which grinds 20,000 tons per day so fine that practically all of it passes a 48-mesh screen, the original ore being fed in 2-in. lumps and finer. This enormous quantity—it would require a string of five-ton trucks 10 miles long to haul it—is ground in ball mills and the finished product removed by classification as fast as it is made. There are several of these mills in which the daily tonnage ground is counted in thousands of tons.

In the rock-products industries there is a great deal of grinding of such substances as silica and limestone and phosphate rock, gypsum, barytes, etc. Much of this grinding is done on the dry material, the separation being made either by screening or by air separation. But where such materials are ground wet, it is usual to separate the finished product by classification.

Use for Fine-Mesh Separation

Classification is preferred as the method for separating out the finished product where the grinding is to a fine mesh. It is rarely used where the product is coarser than 28-mesh, although classifiers are used with mills making a 16-mesh product with good results. One reason for this is, it is rare to find that a finished product is wanted at what may be termed an intermediate size. There is a lot of material crushed coarse, say, to ¼-in. size, and a lot that is crushed to meshes finer than 20-mesh, but comparatively little material is crushed to the meshes between. Hence crushing and grinding, as fine crushing is usually called, occupy rather distinct fields. For separating at the coarser meshes screening is to be preferred.

There are several types of grinding machines which may be used, but as ball mills and tube mills are used so much more than any of the others these types only will be considered in the course of this article.

Open-Circuit Grinding

There are two methods by which a classifier may be employed as a separator with a ball or tube mill; they are called open-circuit grinding and closed-circuit grinding. Open-circuit grinding is very little used. In this method the classifier is sometimes placed before a mill to separate the part of the feed that is fine enough to do without grinding. The oversize discharged by the classifier is then given one pass through the mill and the operation is complete.

Another open-circuit method employs two mills with a classifier between. The discharge from the first mill is classified and the coarse oversize is passed to the second mill, which is supposed to finish the operation. Both arrangements are shown in the diagram marked Fig 46.

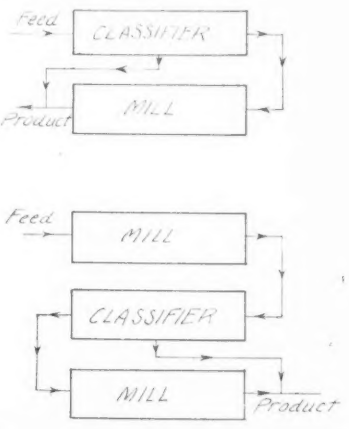


Fig. 46—Diagram of two arrangements for open-circuit grinding

Open-circuit grinding is not to be recommended except in special cases, as where it is used to scour the faces of the mineral grains before sending them to be recovered by the flotation process. Usually, it is necessary that the finished product should not exceed a certain size; this result can only be reached by classifying the material after it leaves the mill and sending back to the mill that which requires further grinding. Otherwise, some oversize product is sure to escape and contaminate the finished product.

Closed-Circuit Grinding

In closed-circuit grinding the mill and classifier are so arranged that no material can go to treatment or to the finished product bin until it has been ground sufficiently fine. In the most usual arrangement the feed is sent directly to the mill. After passing the mill it goes to the classifier, where the finished product is taken off as an overflow. The coarse oversize of the classifier is sent back to the mill for further grinding. Fig. 47 is a diagram of the arrangement and shows the loop or closed circuit in which the material is sent around and around until it has been sufficiently ground.

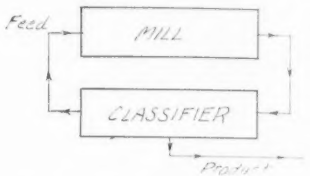


Fig. 47—Diagram of usual closed-circuit grinding

Ratio of Return to Feed

As not all the feed is sufficiently ground by the first pass through the mill, it follows that more material is being held in the closed circuit than is being fed to the mill. This extra material is called the return, and the ratio of the return to the original feed is a most important matter.

The problems of grinding as a whole cannot be discussed here, therefore it will be said concerning this ratio that, as a general rule, the greater the ratio, the greater the efficiency of the mill—that is to say, the more material held in the closed circuit the better, for the more material will be ground.

But in attempting to carry very large ratios of return to feed, it is found in practice that a limit is soon reached. The classifier becomes overloaded before the limit of the mill is reached. One might say to put in more classifiers would remedy that, but there are practical difficulties connected with the settling area and the dilution and the handling of so much material. The whole process would become complex, the machinery unwieldy and the extra efficiency obtained would not pay.

Ratios in Common Use

The return ratios commonly found in practice are from 2 to 1 to 3 to 1 and 2½ to 1 is a very common ratio. Ratios of 5 to 1, and even 6 to 1, have been used, and

have shown a considerable gain in efficiency, but the classifiers had to be very large and a conveyor installed to take the return back to the mill.

Some years ago—in 1914, if the writer remembers correctly—careful tests were made at El Tigre mine, in Mexico, on the relation of the return ratio to the efficiency of the mill. It was found that the curve by which the efficiency was plotted showed a sharp break when the ratio reached 2½ to 1, and that beyond this ratio the efficiency increased more slowly. But in other mills similar tests have not shown so sharp a change in efficiency at this point.

Second Closed-Circuit Method

A variation of the usual closed-circuit arrangement is shown in Fig. 48. The feed

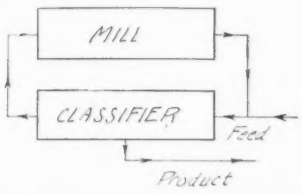


Fig. 48—A second arrangement for closed-circuit grinding

is passed to the classifier before it is sent to the mill, the idea being to remove any portion that is fine enough without sending it to be ground. This method is not practical where the feed contains large lumps.

Requirements of a Grinding Classifier

It will be seen from the foregoing that the classifier used with a ball or tube mill must have certain definite features: It must be of large capacity, as the amount of return to be handled makes the tonnage very heavy. It must be simple and not easy to get out of order, as fine grinding is usually a continuous operation. It takes time to build up the closed circuit, for the material cannot be fed too fast or the mill will choke. In one large mill the writer was told that 10 hours were allowed to bring everything to the right condition so that the mill would run without any especial attention on starting a new mill. In addition to these requirements, it must be a classifier which dewaters as well as classifies.

Effect of Dilution on Grinding

It is usual to have the pulp in a ball mill with approximately 30 per cent of moisture, which is about the consistency of a good mortar. Too thin a pulp washes the grains away from the balls without giving them a chance to be ground, and a thick pulp, while it coats the balls well, is too slow to discharge. In some cases moistures as low as 18 per cent have been found to give good results, and in other cases moistures approaching 40 per cent have been adopted after careful testing, but in the majority of cases a moisture content of 30 per cent has been found the best. Fortunately, all classifiers which discharge the oversize as a dewatered product dewater to that moisture content or less.

Efficiency Depends on Classification

It will be seen from what has been stated that grinding efficiency depends principally upon classification. There may be other things which affect the work, such as running at the wrong speed or with too low a ball load, but in the main it is true that the efficiency of the mill depends upon the efficiency of the classifier. In his own experience in the treatment of ore, the writer has many times seen this statement verified. In some instances the bettering of the classification resulted in such an improvement to the tonnage treated and the recovery obtained that losses were turned to profits, and an unsuccessful operation became a success.

Separative Grinding

It is interesting to note that separative grinding of minerals results from classification, and that this is sometimes of great advantage. In certain metallurgical processes it is important that the metal-bearing part of the ore should be ground very fine, while it is not necessary to grind the gangue beyond a mesh that is much coarser. As the metal-bearing minerals are heavier than the gangue minerals, they are held much longer in the circuit, and hence they are ground to a finer mesh than would be the case if a screen were employed.

(To be continued)

Stock Piling Key to Winter Sales

THE PRACTICABILITY of producing and shipping sand and gravel during freezing winter weather is seriously doubted by the average producer. Of course, where washing plants are concerned production is impossible for many obvious reasons.

Again, when shipping wet sand or gravel during freezing weather, either the shipper or the consignee must take the responsibility of unloading the car, and it is no easy task to thaw out a car of frozen sand and gravel. Besides, the operation involves considerable expense and time. On the face of it, therefore, it does seem impractical to either produce or ship material during freezing winter weather, and practically all plants affected by such conditions lie dormant during this period.

There is this phase of the question to consider, however. During freezing winter weather is the time when most open-top cars are idle, and consequently it is a good time for contractors and dealers to stock up for spring construction work and avoid the rush and delay that come with that period.

During the regular operating period of every plant there is always a time when operations cease for some length of time, due, perhaps, to a shortage of open-top cars or to a lull in the regular busy season. It is during these shutdowns that considerable overhead expense is encountered, for organizations must be kept intact whether the plant is operating or not. It would therefore seem most favorable for plants to keep on operating steadily and when a dull period occurs to turn the material into ground storage.

Wet sand or gravel put into ground storage during this period drains pretty thoroughly when winter comes around, and so is in a dry condition, making rehandling fairly easy. Of course, the cost of rehandling comes into consideration, but this cost is more than offset by the reduction in overhead cost and the consequent business that results in a dormant period.

Then again, there is this to consider: A great many reliable producers concede that there will be no appreciable reduction in the price of sand and gravel for next year. Whether or not freight rates will be lowered is problematical, but a larger demand for material is expected next year and in many localities the demand will increase faster than the supply, because of long-deferred highway and general construction. Freight rates and the law of supply and demand govern the price of material, and even if there should be a reduction in rates, no appreciable reduction in the price of material will follow.

If the rates should come down, the extra cost to the contractor buying his material in winter and storing it until spring will really be only a small cost and will at least insure him so that he will not have to close down his work every few days for lack of material.

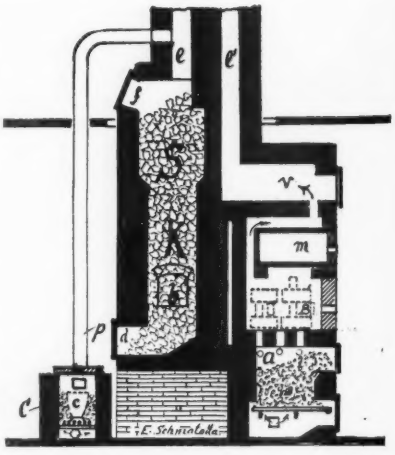
The real cause for sand and gravel plants shutting down during winter seems to be more from force of habit than from anything else. They have not had any active market during winter months and have preferred to stop work rather than assume the burden of stocking materials until next spring. But since there is a chance for such a market during winter months, numerous plants that the writer has seen in Illinois, Iowa, Wisconsin and Missouri have prepared themselves for any emergency by having well-stocked piles of material and efficient means for reclaiming and loading them into cars without any danger of freezing, since the material is dry.

Experimental Lime Kilns

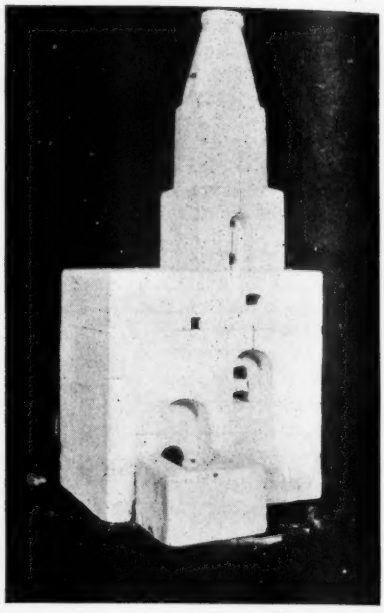
PROBABLY the accompanying view shows the smallest working shaft lime kiln in the United States. It is erected in the laboratory of E. Schmatolla, 250 South 20th Street, Newark, N. J. This kiln is doubly interesting because it is fired by a semi-gas-producer on the principles described in detail in a series of articles by Mr. Schmatolla in ROCK PRODUCTS in 1918.

This lime kiln, extending to the second floor of the laboratory, is fed from this floor. The chimney of course extends on up through the roof. The gas and flame enter the shaft *K* of the kiln through the arch *B*, and the top of the kiln *S* is widened out to form a stone-storage hopper, the same as in large kilns.

At the left-hand side of the kiln is a small furnace *C*, intended for quick tests of small samples of limestone. On the right-hand side is an experimental ceramic kiln with a chamber *B* where samples of brick or other refractories may be subjected to direct firing tests. Above this is a carborundum retort *M* for glazing, enameling and similar testing. The chamber *V* is used for preheating, drying, etc.

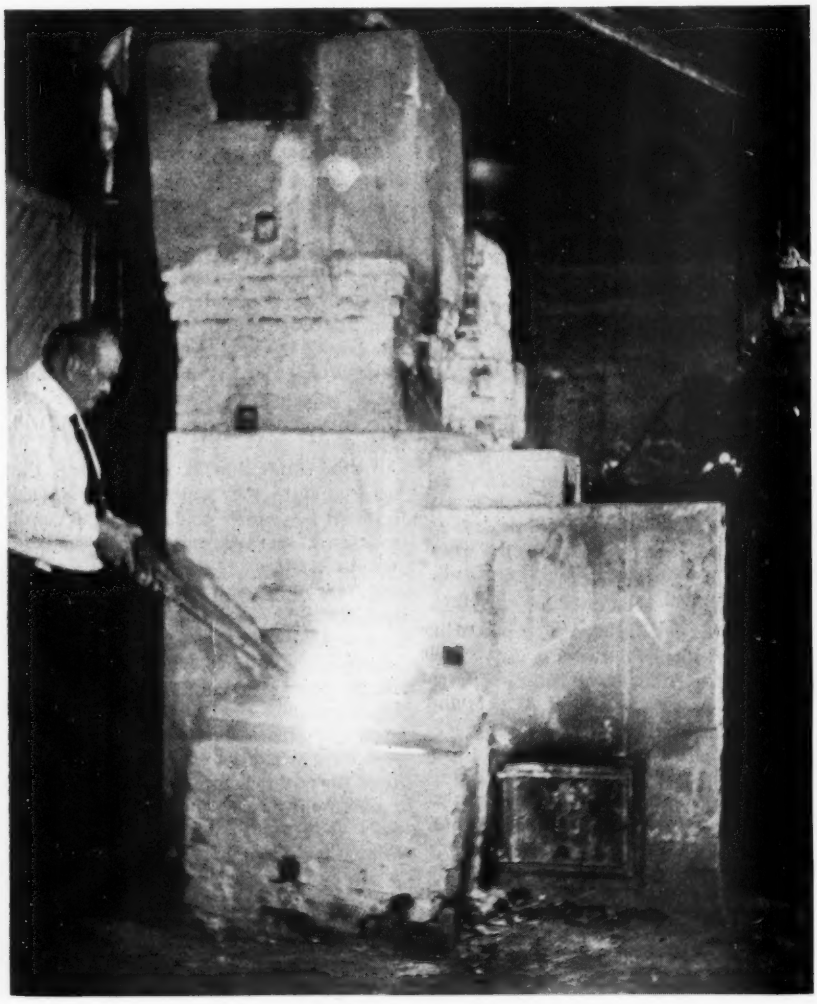


Cross-section of experimental lime kiln

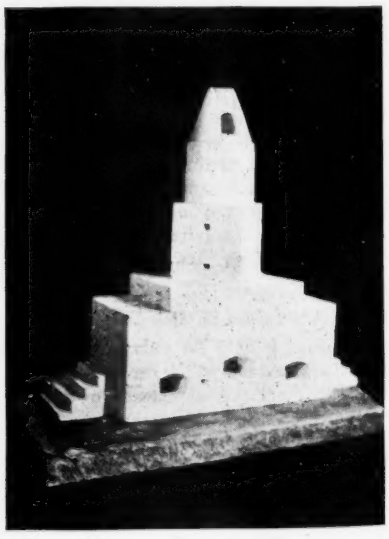


Plaster model of small wood-burning producer-gas lime kiln

Since writing the articles in ROCK PRODUCTS Mr. Schmatolla has been constantly

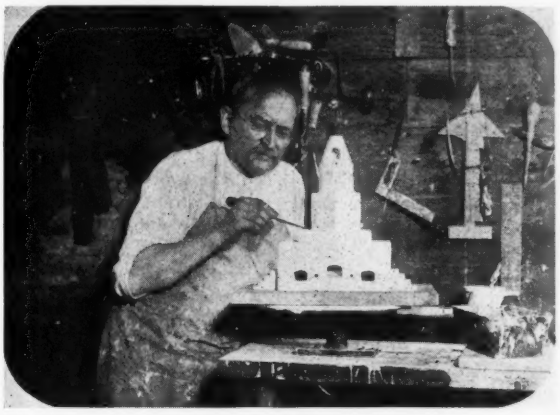


Smallest gas-fired shaft lime kiln



Plaster model of simplest type of semi-producer-gas fired lime kiln. Ordinarily built of stone masonry, with the upper part steel. Whole may be built to be enclosed in steel shell

experimenting upon and perfecting his kiln design. He now has an improvement which makes it possible to connect all four sides of the burning shaft directly with the furnaces, of which there are two, one on each side of the kiln.



F. Schmatolla in his laboratory

Mr. Schmatolla has also devised a method of having his kilns built without the necessity of engineering direction and inspection. This is accomplished by furnishing the purchaser with a plaster model of the kiln, correct in every detail. It has been found that the average brick or stone mason can work from such a model more readily than from drawings.

The new semi-gas-producer fired kiln has been named the "Schmatolla Dauerheim" kiln, in honor of the late Philip P. Dauernheim, of the Glencoe Lime and Cement Co., St. Louis, who was the first man in the United States to adopt this type of kiln.

Patent Issued for New Lime Hydrate

Hard, Coherent Material with Only 15 Per Cent of Moisture

A STABLE HYDRATE OF LIME, containing less water of combination than the normal hydrate, is claimed as a new invention by Harry W. Charlton, Jones Point, N. Y., to whom a patent has recently been issued.

The patent specification contains the following description:

"The invention is based upon the discovery that when the normal calcium hydrate or slaked lime ($Ca(OH)_2$) or ($CaO.H_2O$) is digested with water at a high temperature and pressure, the normal hydrate of lime loses a considerable proportion of its water of hydration and forms a stable hydrate containing less water than the normal hydrate. Analysis of different samples of the new hydrate, after it has been dried in the air by gentle heating, indicate that it has a composition represented approximately by the following formula $CaO.CaO.H_2O$, or a water content somewhat higher than that indicated by this formula; that is to say, analysis indicates that the new hydrate of lime contains approximately one-half or somewhat more than one-half, the molecular water of hydration that is contained by the normal hydrate of lime or slaked lime (or that the new hydrate of lime contains somewhat more than one-half of this amount of water of hydration).

"The new hydrate of lime can be produced, for example, by digesting slaked lime with a sufficient excess of water to permit of easy agitation at a steam pressure of two hundred and seventy pounds per square inch, and at a corresponding temperature, for about half an hour. The new hydrate on filtering is a putty-like mass which dries in the air with gentle heating (*e.g.*, on a steam coil) to a coherent mass having a china-like ring. Although a large excess of water was present during the digestion, nevertheless a sample of the air dried hydrate produced as described showed an ignition loss of slightly more than 15 per cent whereas the water content of ordinary slaked lime, such as that forming the starting material of the above example is about 24.6 per cent.

"The new hydrate has similarly been produced by digestion of five hundred parts of slaked lime with about five thousand parts of water at a pressure of about two hundred and twenty-five pounds per square inch, and at a corresponding temperature, for about half or three-quarters of an hour; and a product has been obtained which, after drying in the air, shows a loss on ignition of about 15.7 per cent.

"The relative proportions of lime and of water, as well as the temperature and pressure of digestion, and the time of digestion, can be varied from those indicated above. So also, the loss on ignition of the resulting product will vary somewhat with the nature and amount of the impurities present, the care with which the product is dried, and other factors.

"On standing for considerable periods of time, the new hydrate has been found to slowly absorb moisture and carbon dioxide with resulting partial conversion into a carbonate or into a higher hydrate. Thus samples of the new hydrate, after standing for some months exposed to the air, showed an ignition loss of about 16.5 per cent.

The specific gravity of the new product, as indicated by certain specimens thereof, has been found to be about 1.95, whereas the specific gravity of calcium oxide (CaO) is 3.25 and that of the common slaked lime or calcium hydroxide $Ca(OH)_2$ is 2.078. Accordingly, although the new product is intermediate in its degree of hydration between the anhydrous calcium oxide and the normal calcium hydrate, its specific gravity is less than that of either of these known products.

"The new product before drying seems to have characteristic properties making it resemble putty and adapting it to be molded. So also, the new hydrate possesses characteristic properties when used in the production of certain plastics, possessing superior bonding properties, for example, when used in the manufacture of sand-lime bricks or insulators. I do not, however, claim the production of such sand-lime bricks or insulators herein, as such bricks form the subject-matter of a separate application.

"The new hydrate of lime can also be produced in intimate admixture with other materials by adding such materials to the slaked lime before digestion, or by adding materials which will react with part of the lime during digestion to form reaction products which will remain intimately admixed with the new hydrate at the end of the digestion."

Lime Makes Us Healthy and Efficient

NOTABLE physical and mental development of the peoples of the earth, says *Physical Culture Magazine*, is due to food that supplies much lime; that tuberculosis and other diseases are combatted and the functioning of the body muscles is favored by lime. Modern tendencies have so refined foods—taken the hull from rice, bran from bread, etc.—that we are robbed of the nutriments.

Varied Operations at the Santa Cruz Portland Cement Company

No. 1—Complete Description of the Processes Used in Manufacture of Portland Cement—Importance of Raw Materials and Accurate Mix

By Llewellyn T. Bachman
Directing Chemist, Santa Cruz Portland Cement Company, Davenport, California

UNFORTUNATELY, MANY OF THE DESIGNING engineers who have designed the earlier dry process cement plants, even as late as fifteen years ago, have not only failed to grasp, or became reluctantly reconciled to, the true basic underlying purpose in cement manufacture, but have either carefully avoided or deliberately ignored in favor of their convictions, sound and practical suggestions long since proven to have become portending influences in the success of the enterprise. They have designed and constructed for mechanical and structural simplicity and for initial and operative economy, sacrificial or compromisingly to the basic purpose of the investment.

In result, many branches of the industry have failed, others struggled for existence, while those remaining, among which this plant may be included, were forced either to abandonment or to so design, reconstruct and adapt the plant with improved systems for operation as would mitigate the influences upon the quality and its control.

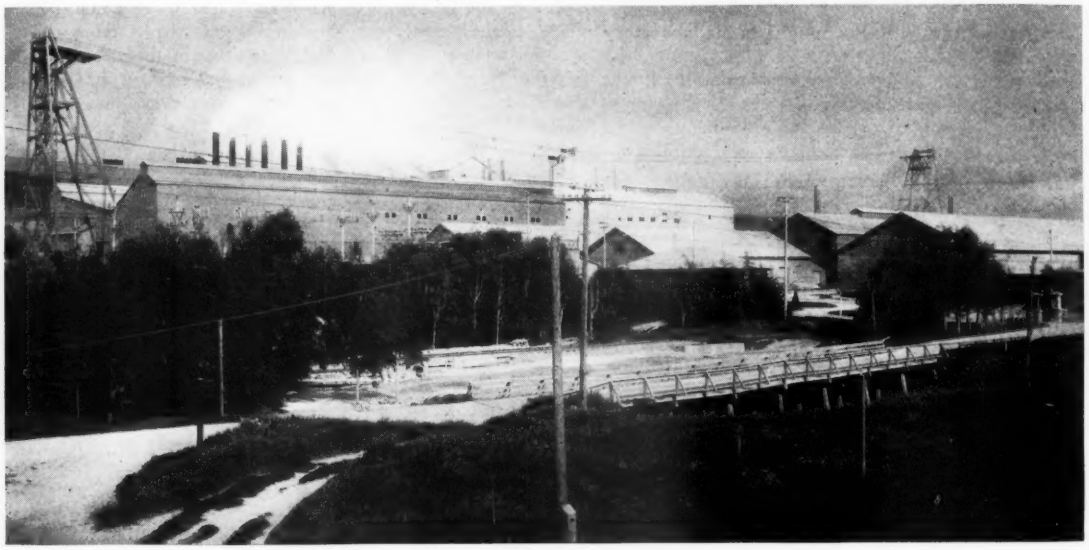
The day when cements of questionable character may be imposed upon the consumer has long since passed; deservedly so, in that it also had its predatory effect upon the fallacious principles and convictions among the earlier designing and constructing engineers on dry process plants.

That a greater importance lies now in how much better a cement may conservedly, economically and safely be made, in the largest quantity for a given unit of effort without inflicting any compromise upon its quality, is manifested in the co-operative attitude of the personnel which operates within the scope of the industry.

Obviously each stage in the manufacturing process demands applied consideration for organized efficiency and practical control as well as simplicity of design and construction.

In the omission of that controlling principle which rules, governs, guides and guards each step in the manufacturing process, the industry today would fall en masse.

Fortunately these controlling principles are applicable to those plants operating under the dry process as well as those on the wet process; and it is not the purpose of this writing to discount the relatively simplified operation and ease of control inherent in the wet process; but aside from the descriptive references involving the process of this plant, it may be of interest to some readers to have pointed out the scope in which the power of control substantially and effectively applies. Whether we manufacture cement to just comply with specifications or devote our attention to making it as well as the raw materials will permit and make it constantly uniform, involves a wide range in service.



Plant of the Santa Cruz Portland Cement Company

Raw Materials

Essentially, the raw materials, whatever they may be, must not only be suitable in character, but must be correctly formulated, intimately mixed, finely ground for burning, and uniform in the resultant raw composition.

Similarly, the operative process of mixing and grinding with the clinker, gypsum of varied size and quality, effectively imposes conditions upon the resultant cement, which are obviated only by control.

The first difficulties which affect uniformity of raw materials arise in the

quarries. Limestone deposits suffer from considerable contamination with soil from overburden not thoroughly stripped, from clayey or shaly materials foreign to limestone but interlaced with it, and rock of irregular composition; the combination of which is hopelessly mixed when quarried.

The specific gravity of the several materials not only varies but the crushed product also varies in size and weight so that at every point of delivery a segregation of the finer from the coarse materials takes place; the finer remaining in the center while the coarser roll outward and downward in forming the pile. The occurrence is the same whether delivered into rock storage or bins supplying preliminary grinding machines.

Fig. 1—General view of quarry

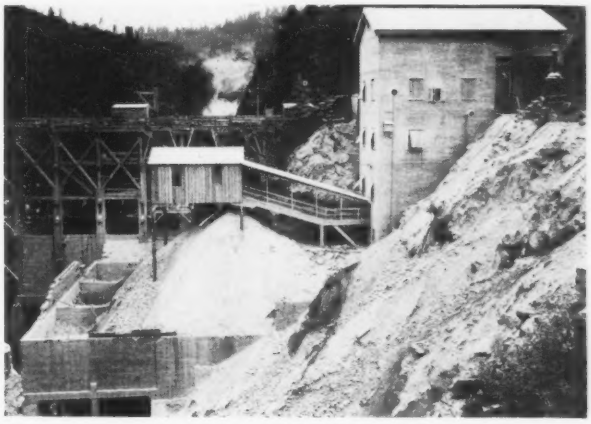


Fig. 2—Crushing equipment and storage bins at quarry

Avoidance of this segregation being almost a practical impossibility, the difficulty in formulating a raw composition from crusher product can readily be appreciated. It is absolutely impossible for the laboratory to obtain an average sample of the limestone proportionate to the clayey material mixed therewith, and therefore impossible to arrive at a representative analysis upon which the original formulation so largely depends.

Segregation of Material

That principle of mixing clay or shale with the limestone before crushing only serves to complicate matters infinitely worse. When the crushed product of the quarried limestone is stored, the segregation of fine and coarse is not only continuous, but the degree of segregation is seriously affected by the handling of the materials when wet; and whatever the arrangement for drawing the material may be, this physical segregation is not overcome.

In drying the material in rotary dryers, the heavier and coarser limestone falls farther and advances more rapidly, by the action of rotation, than its component portion which constitutes the clayey materials; so that the first discharge is principally limestone of a very high lime content which is followed by a mixed mass of both, while the last, after the feed has been cut off and the dryer rotated until empty, constitutes principally the silicate materials. This serves to impose extreme irregularities; and if the feed constitutes a composition formulated on crusher product, both the former and latter discharges from the dryer would be entirely unsuited for a cement composition.

A similar degree of segregation takes place in the ball mill bins supplying the feed to the ball mill for a subsequent reduction. When the grinding proceeds simultaneously with the filling of the bin with crusher product and continued until the bin is empty, experience has proven that the range of variation in lime content covered 12 per cent during the cycle of operation.

Whatever the course of procedure for the modification and equalizing of these extreme irregularities may be, the effect will be an unsatisfactory one so long as the raw materials are dealt in this form when formulating a raw composition.

Mixing of Gypsum

Another phase in the system for control applies to the mixing of gypsum to the clinker prior to ball mill grinding, and likewise deals with the degree of segregation taking place. When the gypsum is in the form of a finely crushed product or a gypsite, only minor consequences are imposed by segregation; but when using No. 5 crusher product, as this plant does, it must be controlled by manner of operation. Such a product ranges in size from two inches to dust; and when the mixed stream of clinker and gypsum is so directed and divided to simultaneously fill a number of ball mill bins, the first bins will have received the larger percentage of fines in insufficient quantity, while the last one will contain principally coarse in excess. The clinker in the first bin will of six will contain 2.4% SO_3. Obviously the percentage of SO_3 in the resultant cement will entirely depend upon how many of the ball mills are operating. The product from the first two mills would be quick setting with attendant coating of the pebbles in the finishing tube mills; and that from the last two mills would contain an excess of sulphur trioxide, contain 80% SO_3 and that in the last one The difficulty is obviated by directing the entire stream of mixed clinker and gypsum first into one bin and then into another by regulation of slides.

Location of Plant

The plant (shown elsewhere) is located very near the shore line of the Pacific Ocean at a distance of twelve miles northwesterly from the city of Santa Cruz. It is connected with Santa Cruz by a branch railroad owned and operated by the Southern Pacific Co., which provides for exceptional shipping facilities and a continuity of excellent service.

Most of the employes have their homes in Santa Cruz, which is located between the Santa Cruz Mountains and Monterey Bay, and commute back and forth on three operative shifts of eight hours each.

This plant has been in operation since 1907 and covers an area of about 35 acres. The company's holdings, on which are located the deposits of limestone and clay, constitute over 2,000 acres. With few exceptions all buildings are constructed of concrete and steel.

The raw materials from which cement is manufactured are limestone and clay handled under the dry process. The plant is in operation both day and night throughout the entire year and employs a daily average of about 350 men.

Quarry and Quarry Crushers

The present working quarry (shown in Fig. 1) is confined to one of the largest deposits among the company's holdings located at the head of San Vicente Canyon at a distance of two and

eight-tenths miles from the plant. Access is acquired through a narrow gulch, on both sides of which the limestone rises in precipitous cliffs to a height of 300 to 500 feet from the quarry floor. The working floor was formed by blasting down the limestone on both sides of the gulch, filling the narrow canyon to a depth of 85 feet.

This floor now is approximately 2,000 feet in length and 1,000 feet in width and receives the tonnage blasted from the face by charging tunnels with ammonia powder of 30 per cent, in quantities ranging from 5 to 20 tons according to size and weight of body to be removed.

The tunnels are projected by experienced operators with the aid of compressed air for drilling and 35 per cent nitro-glycerine for blasting. All sizes too large for practical purposes are further reduced by drilling with Sullivan rotating hammer drills and block blasting or bull dozing with 35 per cent nitro-glycerine.

The loading equipment consists of three steam shovels; the largest of which is an Osgood No. 73 with a dipper of 3 yards' capacity, the second a Marion No. 41 of 1½ yards and the smallest a revolving Osgood No. 18 with a one-half yard dipper, which deliver the limestone into two way dump cars of 36-in. gauge—K & J type—each having a capacity of 4 yards.

Upon the operating floor and leading to the crushers is maintained a 36-in. gauge semi-circular track system upon which are operating four 20-ton 36-in. gauge steam locomotives, two of which are Davenport type and two of the Vulcan type; each operating with a train of four dump cars for transporting the limestone from the steam-shovels to the crushers.

Crude oil, which is used as a fuel for steam shovels and locomotives, is pumped into a supply tank located at a convenient distance from the scene of operations, from which the locomotives receive their supply direct; while that consumed by the steam shovels is supplied by miniature tank cars loaded at the supply tank at night and transferred to convenient locations near the shovels for discharge into the fuel tanks.

The crushing equipment (shown in Fig. 2) located at the quarry comprises three types of machinery; an Allis-Chalmers Fairmont roll type crusher, 36x60 in., driven by a 150-h.p. motor, which discharges its product into a No. 7 Williams Jumbo impact pulverizer operated by a 200-h.p. motor. The third and individually operated crusher is a No. 9 Gates gyratory, driven by a 150-h.p. motor. The product from both the gyratory and roll crushers is approximately of 4 in. and 6 in., respectively, and that of the Williams mill is discharged in sizes ranging from fines to 2½ in.

The 30-in. inclined belt which receives the product from the Williams mill discharges into an open concrete bin of about 2,000 tons' capacity, provided with eight chute openings of liberal dimensions easily and effectively controlled by gear type operating slides of original design.

The gyratory crusher, mounted on a massive foundation at an elevation of 70 ft., discharges its product directly into a separate bin of 400 tons' capacity, erected at the entrance to the quarry and directly across the canyon. Similarly controlled openings are provided for the drawing of the limestone from this bin.

The air consumed by the hammer drills in the construction of tunnels and drilling the larger blocks of limestone is furnished at 80 lbs. pressure by a No. 3 Sullivan air compressor, 17x9¾x12 in.

The quarry and crushing equipment is operated during day time only over a period of 8 hours and furnishes a daily average of 1,800 to 2,100 tons of limestone.

The limestone analyzes as follows:

	Clean Limestone Pct.	Quarry Run Pct.
Oxide of Silica (SiO_2)	0.46	8.42
Oxide of Iron (Fe_2O_3)	.24	1.08
Oxide of Alumina ($2O_3$)	.29	4.04
Oxide of Lime (CaO)	54.90	47.07
Oxide of Magnesia (MgO)	.42	1.59
Sulphur Trioxide (SO_3)	trace	.63
Oxide of Potassium (K_2O)	trace	.54
Oxide of Sodium ($Na2O$)	trace	.36
Ignition Loss	43.79	36.76

Clay Quarry

The clay quarry is located on the company's holdings which comprise approximately 250 acres, 16 miles north of Santa Cruz at Tank Siding, near Glenwood, adjacent to the Southern Pacific Railroad, extended from Santa Cruz to Los Gatos and known as the Mountain Division. The deposits rise to an elevation of approximately 100 ft. from which the clay is removed by a No. 18 Osgood revolving steam shovel with a half yard dipper, into two 2-way, 4-yard, 36-in. gauge dump cars which discharge into service maintained, specially sided standard gauge flat cars, located on a spur siding in proximity to a conveniently constructed loading platform. To obviate the difficulty of handling clay when wet, quarrying operations are suspended during the wet season and an excess is quarried during the period favorable to operation and stored at the plant as a supply for continuity of plant operation.

The Southern Pacific Co. delivers the clay to the company's trackage where it is unloaded by a stationary hoist and grab bucket to the first 6x80-ft. rotary dryer or by a 15-ton Brownhoist locomotive crane to open storage.

Quarrying is confined to day operations only for periods of eight hours and the production averages about 300 tons per day, of which approximately 115 tons are consumed for plant operation.

The character of the clay is soft, unctuous, well combined and comparatively free from sand. By analysis it affords the following:

	Pct.
Oxide of Silica (SiO_2)	52.67
Oxide of Iron (Fe_2O_3)	7.90
Oxide of Alumina (Al_2O_3)	19.73
Oxide of Lime (CaO)	3.08
Oxide of Magnesia (MgO)	2.46

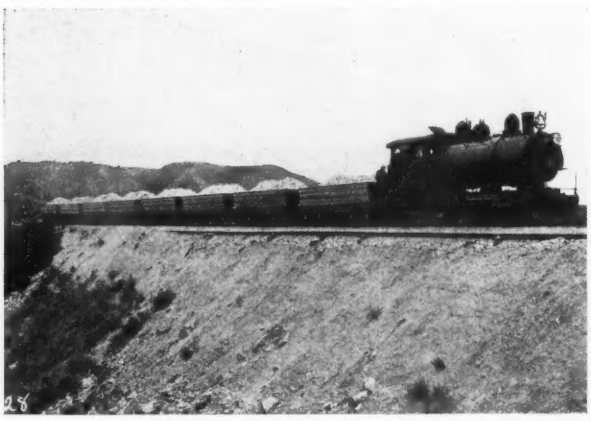


Fig. 3—Rock transportation from quarry to plant

Fig. 4—Crusher building, rock storage and locomotive round house

Sulphur Trioxide (SO_3)	1.80
Oxide of Potassium (K_2O)	2.84
Oxide of Sodium (Na_2O)	1.62
Ignition Loss	8.72

Limestone Transportation

After drawing the limestone through the bottom chutes of the elevated bins directly into steel side dump cars of 20 tons' capacity, train loads of eight cars each (Fig. 3) are transported over a standard gauge track to the plant by two oil burner equipped Porter locomotives, in alternate use, the weight of each being 42 tons and 47 tons, respectively.

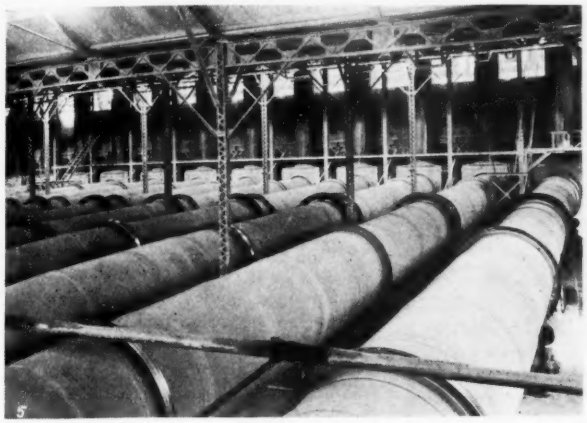


Fig. 5—Rotary kilns

Fig. 6—Clinker storage

Crushing and Storing Limestone

The cars containing the limestone are run over track scales, weighed for tonnage and discharged into a second set of two No. 6 Gates gyratory crushers operated by a 150-h.p. motor. This constitutes the second reduction (see Fig. 4).

The crushers are so arranged to discharge onto a 24-in. inclined belt, 200 ft. between centers, which conveys the 2-in. crusher product into a rock storage with a capacity for 12,000 tons. Three 20-in. horizontal belts with three Robins automatic trippers serve to distribute the limestone over the rock storage area. The rock storage has 54 discharge outlets provided with an equal number of rocker feeding devices which discharge the limestone from any one or all collectively to a system of 20-in. belts loading to a cross belt, which conveys the material into the raw mill building for its final preparation for the kilns.

Raw Material Preparation

Two rotary dryers, 6x60 ft. in dimensions, receive the limestone from the 20-in. cross belt for its drying preparatory to grinding. From the discharge end of the dryers the limestone is elevated into McCaslin bucket conveyors which distribute the discharge into 10 ball mill bins.

The clay, which requires a similar preparation, is stored in an enclosed bin of 1,500-ton capacity, to which it is elevated and conveyed after receiving its first preliminary drying. Clay, possessing the characteristics for retaining water which is removed only with difficulty, complicates the method of procedure in its preparation for grinding. To obviate this difficulty the clay is transferred from the bin storage in cars of 5 tons' capacity on an inclined narrow gauge track to a second 6x60-ft. rotary dryer for its final drying. The dry clay is subsequently elevated and conveyed to a single ball mill bin.

All bins supplying the feed directly to the ball mills are of circular, hopper type, steel construction, with a capacity for 30 tons.

A third reduction is effected by the operation of No. 8 Gates ball mills driven in pairs by a 150-h.p. motor, each of the two raw materials being ground separately and their product elevated and conveyed to separate bins; twelve for limestone, each having a capacity for 88.5 tons, and eight for clay, each holding 69.5 tons.

It may be noted that, up to this step in the procedure, any attention leading to the analytical determination of constituent values in either limestone or clay has been purposely omitted; deservedly so, in that any assurance for procuring representative samples was hopelessly obscured by formidable segregation.

The 14-mesh product from the ball mills, however, does not suffer any degree of separation sacrificial to all practical purposes, and therefore responds, with reliability, to any practical principle for obtaining samples.

Sampling Devices

Automatic revolving sampling devices, one each for limestone and clay, conveniently and accessibly placed under the screw conveyors leading to the bins referred to by-pass into a container of 1 cu. ft., a portion of the material in transit, at intervals of 7 seconds, so regulated to deliver a sample of ¾ of a cu. ft. to represent the filling of each bin.

Appreciating the advantages of liberal quantities for samples and also the disadvantages in thoroughly mixing and quartering samples in like quantity for the laboratory, a mixing and quartering machine of the writer's original design is now in use.

On completion of the analyses of samples representing the contents of the separate bins, a raw composition is formulated in the laboratory and records, giving weights for both limestone and clay, as well as the specific number of the bins are submitted to the weighmaster, who makes a corresponding adjustment on the weighing machines.

The two separate raw materials are then drawn simultaneously from their respective bins into a battery of two power controlled automatic weighing machines, which again simultaneously discharge into double screw, paddle, cut flight mixers. From the mixers the raw composition is elevated, sampled and conveyed into 14 tube mill bins.

Tube Mills

The tube mills which effect a final grinding of the raw composition are of the Gates type, 5½x22 ft., operated in pairs by a 250-h.p. motor.

The grinding medium in three of these mills consists of a charge of 14 tons of ⅞ in. steel balls and the balance have a combined charge of pebbles and cylpebs mixed (not in separate compartments) in the ratio of 7 tons of cylpebs to 9 tons of pebbles. Cylpebs are made from 7/16 in. soft steel rods in the company's shop. The surface of the combined charge is maintained at a vertical depth of 30 in. from the inside of the "Silex" lining. Owing to the relatively high center of gravity of the charge and the exposure of increased grinding surface, a corresponding fine product is obtained without dangerously imposing upon the consumption of power. This method of procedure substantially balances the grinding de-

partment with the kiln department, mill for kiln, and delivers a product having a fineness of not less than 91 per cent passing the 200 mesh.

All of the tube mills discharge into one unit of a single screw conveyor leading to the kiln room and the product in transit is sampled by grab method each hour (not an average of the material passing in one hour) by the laboratory for record and for the purpose of ascertaining the extent of variation, if any. The raw composition is then elevated and conveyed to the kiln bins, 14 in number, each with a capacity for 100 tons.

Kiln Building

The kiln department comprises 14 Allis-Chalmers rotary kilns, 7½x7x125 ft., in dimensions (see Fig. 5) individually operated and controlled by a 30-h.p. variable speed motor, with the controller at the burner end of the kiln, and 7 vertical stationary circular coolers with an individual capacity of 390 barrels. The kilns operate on a pitch of ¾ of an inch per foot and the burning is accomplished by the use of crude oil and compressed air. The oil is of 17 to 19.9 degrees Beaume gravity, heated by a supplementary steam line and consumed under a pressure of 75 lbs. The air pressure is 80 lbs. at the burner. Each kiln consumes approximately 115 barrels of crude oil per day of 24 hours.

At the stack end of each kiln circular castings of original design, to exclude the admission of air into the stack and at the same time provide for the linear as well as the eccentric movement of the kiln, are satisfactorily provided.

Starting from the firing end, the kiln lining comprises the following: 12 ft. 6 in. of 9 in. kiln fire brick, 22 ft. of 9 in. clinker brick through the burning zone, 15 ft. of 9 in. kiln fire brick and 75 ft. 6 in. of 6 in. kiln lining bricks.

As a measure for control of both fuel and temperature, each pair of kilns is equipped with a Thwing pyrometer, which records the stack temperature of each kiln through thermo-couples projecting into the stack at a distance of 23 ft. above the center of the feed end of the kiln.

The kiln discharges its burnt clinker into a pit from which the clinker is elevated and discharged into the vertical coolers and cooled by air supplied by Sturtevant steel pressure blowers. From the coolers the clinker is drawn in portable steel skips of 27 barrel capacity, resting upon narrow gauge trucks, to be transferred to the open clinker storage.

Clinker Storage

To the steel skips containing the clinker are attached the lifting chains suspended from a movable carriage supported by a 2½ in. steel strand cable resting upon steel supporting towers 950 ft. apart and 130 ft. high, and transferred to the open clinker storage (shown in Fig. 6) adjacent to the kiln building, by a well controlled installation known as the Flory hoisting and cable apparatus. The suspended skip is carried to and from any location on the clinker storage underneath the cable and dumped under complete control by the operator stationed in the hoist building located beyond one of the supporting towers. At the termination of the cycle of operation the empty steel skip is again returned to the waiting truck for refilling.

The operating equipment is of duplicate installation and driven respectively by 110 and 150-h.p. motors; the double installation provides not only for emergencies but for the demands of peak production.

To facilitate the drawing of clinker from storage, underground tunnels, 14 in number, 25 ft. apart and 200 ft. in length, are provided with 20 in. belt conveyors, which convey the clinker on to a 24 in. cross belt conveyor leading to the finishing mill.

The area of clinker storage floor directly accessible from the tunnels comprises 80,000 sq. ft. and has 210 chute outlets, at 13 ft. centers, for the removal of the clinker. The quantity of clinker which may conveniently be stored at this plant approximates 500,000 barrels.

The fundamental advantages in providing for a large clinker storage lie principally in flexibility and readiness for meeting peak demands, more than for ageing and aerating the clinker. While some opinions still favor the latter as a necessity, this plant has positive assurance that it possesses no advantages when the processing of the raw materials is thoroughly controlled.

Finishing Mill

The clinker is received in a steel bin provided with two outlets, one leading to a 6 ft. x 60 in. dryer in which a low fire is maintained for drying the clinker when too wet for grinding and the other to a 20 in. inclined belt, both operations discharging into a concrete bin of two compartments, one for clinker and the other for gypsum located above the weighing machines.

Gypsum is obtained from Nevada and delivered by the Southern Pacific Co. to a No. 5 Gates gyratory crusher and the crushed product is elevated into a bin from which it is drawn by an 18 in. belt to the compartment over the weighing machines. The sulphur trioxide content in the gypsum varies from 44 per cent to 45.5 per cent.

Prior to the installation of weighing machines for the control of both gypsum and clinker, the rate of feed was controlled by the operation of adjustable rocker feeding devices which proved very unsatisfactory. It was a practical impossibility to control the desired quantity uniformly, inasmuch as both clinker and gypsum were alternately wet or dry, fine or coarse and continuously changing so

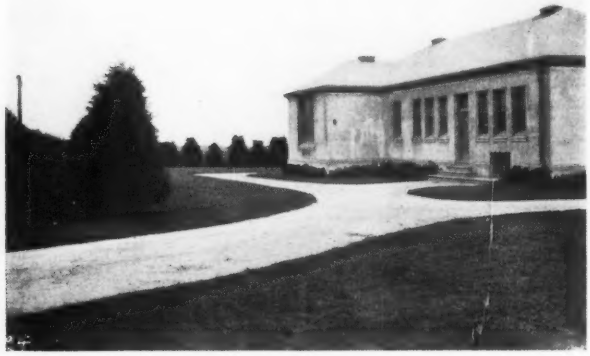


Fig. 7—Emergency hospital and its attractive surroundings

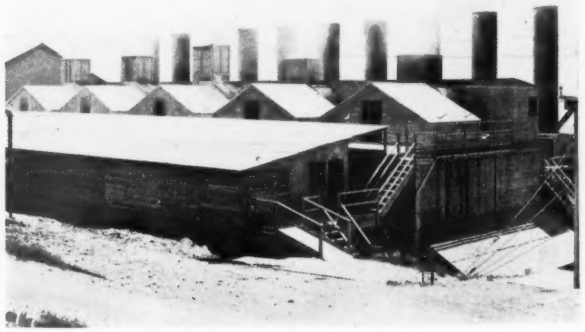


Fig. 8—General view of potash recovery plant

that any adjustment of feeders for more or less of either clinker or gypsum, one might make, just as frequently effected a result twofold in the opposite direction.

For the double purpose of gaining a positive control of the materials and weighing the tonnage, a battery of two automatic weighing machines were installed, one for clinker and the other for gypsum, on which the simultaneous discharge was controlled by a power operated tripper.

In operation a fixed weight of a thousand pounds of clinker is maintained on the clinker scale and the adjusted weight applied to the gypsum scale according to quality and moisture content of the gypsum. Interested readers might appreciate knowing that, after many years of operation, this manner of control for the setting time of the cement has never failed.

The combined charge of clinker and gypsum from the weighing machines is elevated and conveyed, without any division or separation of the stream, into 12 ball mill, steel, hopper bottom, circular bins, each having a capacity for 188 barrels.

Twelve ball mills, similar in type and size to those in the raw department, grind the clinker through 14 mesh toncap screens and the discharged stream passes through elevators and conveyors to 14 bins of 249 barrels capacity, supplying the feed to the tube mills for final grinding.

The tube mill installation consists of 14 Gates type, 5½ ft. x 22 ft. white iron lined, motor driven mills, eight of which have a mixed charge of 6 tons of cylpebs and 11 tons of flint pebbles and the remaining 6 are charged with pebbles only. The vertical distance between the topmost point inside the lining to the surface of the mixed charge is maintained at 31 in. and that of the pebble charge 25½ in.

The finished product, which is ground to pass 80 per cent through the 200 mesh sieve, is discharged from all of the tube mills into a single screw conveyor, then elevated and again conveyed to the stock house. Automatic samplers, similar to those in the raw department, sample the cement while in transit, after which the samples are transferred to the laboratory each hour for test.

Stock House and Packing

The stock house, which consists of 20 separate bins, varying in capacity from 3,500 to 15,800 bbls., is of concrete construction and has a total capacity of 106,000 barrels. The base is of hopper and tunnel type construction, two of which run longitudinally through the entire length of the stock house.

Screw conveyors convey the cement from any one of the bins to the packing bins adjacently erected. These supply three sets of packing machines. One set comprises two 4-spout Bates machines for valve bags, another set three 4-spout Bates machines for open mouth sacks and the third a set of 4 barrel packing machines, centrifugally operated and of original design. The one set of machines filling valve bags has an accessory 24 in. conveying equipment for transferring the filled sacks directly into the cars, while the other filled containers are trucked.

A recent adjunct for loading cement into cars has been installed by diverting the cement from one of the packing bins to an elevator of sufficient height to deliver, by gravity, the cement into the cars in bulk.

Beginning at a point at one end of the loading platforms on each side of the stock house, two car tracks on a slight incline are run on an extended line of about 900 ft. to provide car storage while loading. The incline enables the operator to shift his cars by gravity, or if desired, by an alternate method of operating an electric Shepard type car puller directly to the loading platforms, which provide for seven cars on either side. This arrangement has satisfactorily responded to shipments of over 10,000 barrels per day.

Sack Cleaning

Return shipments of empty sacks are supposed to be delivered in bundles of 50 sacks each. While unloading, each shipment is checked for content number of bundles and subsequently subjected to a process for cleaning.

The cleaning equipment consists of two units of enclosed cylindrical rotating drums, 10 ft. in diameter, with slatted perimeters. A given number of sacks are lifted to a platform and placed into the drums through a door, at top most position, which forms a section of the perimeter. By rotating the drums the sacks are cleaned and the slatted perimeter allows the cleanings to drop through to the floor underneath. On removal of the foreign matter by screening, the cleanings are returned to the tube mills for regrinding.

The sacks when cleaned are removed from the drums, rechecked, sorted and classified as serviceable, non-serviceable, reparable, foreign, etc., for record and credit. Reparable sacks are sewed, patched and piled with other serviceable ones for re-service. Valve bags are tied by Bates power tying machines in a separate building, which houses also deliveries of new sacks and paper liners.

Air Compressor Building

Compressed air adapts itself readily to varied application throughout the plant, but the principal consumption is utilized through the oil burners on kilns and dryers. This is supplied by five Ingersoll-Sargent compressors of two types, given machines operated only to meet the periodical requirements of the plant.

Three of these compressors are of duplex type, 20¼ in. by 24 in., each operated by a motor of 250-h.p., and deliver 1,705 cu. ft. of air per minute each at 80 lbs. pressure, while the other two of compound type, delivering respectively 1,205 cu. ft. and 348 cu. ft. per minute, are respectively operated by 150 and 75-h.p. motors.

The air consumed in cooling the clinker is furnished by six Sturtevant steel pressure blowers herein located and operated in sets of three by a 50-h.p. motor.

Machine Shop and Stock Room

The machine shop is fully equipped with various kinds of machines to facilitate all necessary repair work accruing at the plant. The adjoining stock room has a complete stock of supplies and duplicate machine parts, which are systematically segregated for convenient access and its contents accounted for through a stock ledger.

Power

Electric power, furnished by the Pacific Gas & Electric Co., is used exclusively at this plant. The three-phase alternating current of 60,000 volts is transmitted over high tension lines to the transforming station at the plant, where the current is transformed to 2,200 volts, supplemented by plant transformers to lesser voltage, where necessary, and conducted to the various motors, 115 in number, varying from ½ to 250-h.p.

Emergency Hospital

In addition to special attention given to conditions effecting the safety of operations and hygienic welfare of the employes, an emergency hospital (shown in Fig. 7) with pleasing surroundings is maintained. It is provided with an operating room, two wards, dental and medical offices, each with complete equipment, and is occupied by a resident surgeon in constant attendance.

Crude Oil Storage

Crude oil tank cars as delivered at the plant are run over a concrete trench of sufficient length to support nine cars, into which the oil may be simultaneously discharged from each car. The trench has a sloping bottom from both ends to the center, where a 12 in. pipe conveys the oil by gravity to two large storage tanks, with a capacity of 37,000 barrels each, located directly on the shore line of the ocean, at a distance of 600 ft. from the oil trench.

The oil is of 17° to 19.9° Beaume gravity, and pumped from the tanks through pipe lines, supplemented by a steam line to facilitate the flow of oil, into a pressure tank from which the oil is distributed throughout the plant at a pressure of 75 lb.

(To be continued)

Valuation and Depletion

Principles Involved and How Valuations Are Made of Rock Products Operations

By Wm. H. Kobbe
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PRODUCERS of rock products are naturally interested in the subject of depletion and often ask: "What are the accepted rates governing these minerals?"

This question has not only been suggested by the requirements of Federal taxation but the industry is beginning to realize that depletion is a factor in the business.

Everyone knows that the various rock products are minerals, but little effort has been made to investigate the true value of deposits of limestone, trap rock, glass sand, foundry sand, gypsum, phosphate, sand and gravel, and this subject represents an interesting field for study.

There are no specific answers for the question, "What are the accepted rates governing these minerals?" The rate for depletion depends entirely upon the nature and value of the deposit and the number of tons or cubic yards contained therein. The question already quoted therefore leads to two more: What is the value of the deposit? How many tons or yards does it contain?

These questions in turn lead to others: What kind of value is meant? How is such value to be determined? What effect has nearby transportation facilities? Is there such a thing as "value to us?"

Further discussion brings up such terms as "going concern value," "fair market value," "economic injury," "depletion sustained," "depletion allowed" and many more, until the ordinary rock products man throws up his hands in disgust and says he doesn't know anything about it but intends to deduct 10 cents per ton for depletion—that everybody else is doing it and he believes it is about right anyway.

First Principles

In order to avoid abstract discussion and to encourage the rock products industries to approach the question from the right point of view, it is well to state that valuation and depletion are not such intricate questions after all.

"Value" may be defined as the exchange value in dollars, while the "fair market value" means the amount of money which would induce a sale as between a willing seller and prudent purchaser, provided both seller and purchaser possess enlightened knowledge as to the particular commodity changing hands. This is practically the definition used in the Regulations with the added provision that enlightened knowledge is necessary. If the word "fair" implies justice, it would seem that such provision is essential to limit the phrase "fair market value." Two well-informed gypsum producers should be able to arrive at a pretty fair valuation for a gypsum property, but if one of these operators should purchase a deposit from an ignorant farmer the latter transaction could hardly be considered as fixing a "fair market value."

Having defined what is meant by fair market value, or, in other words, "What is it worth?" the question naturally arises: "How can this be determined?" This may be answered by replying to the question, "How would one proceed to induce a prudent purchaser to buy a property?"

What Will a Purchaser Pay?

To convince such a prospective purchaser of the true worth of a rock products property, you would naturally point out to him the earnings derived from such a property. On the other hand, such earnings might indicate a very low value. Possibly your records fail to differentiate between earnings and return of capital. Your provisions for depletion and depreciation might be inadequate or in some cases entirely lacking. The "prudent purchaser" in the meantime might be asking himself the question, "What might I expect to earn from this property by applying better management and exact accounting?"

It follows, therefore, that "exchange value" is largely reflected by true net operating profits and the value on any particular date may be rather closely determined by discounting such expected operating profits over the approximate life of the deposit. Hoskold's formula is commonly used for this purpose and permits of the determination of the present worth of the deposit. This formula provides for redemption of capital at 4 per cent compounded annually and interest to investor at a rate commensurate with the risk involved. This hazard varies in different industries and is generally accepted at 10 per cent in underground mining and would probably be 6 per cent or 7 per cent in the ordinary quarry, pit or bank operation. Since a certain plant is required to insure these profits, such plant is usually deducted from the value of the property in order to determine the present worth or value of the mineral deposit.

Income Tax Features

The "basic date" or date of valuation is stances of the case. As a rule it is March generally governed by the peculiar circum-1, 1913, for purposes of Federal taxation, date of acquisition, date of reorganization or other significant period in the history of the company.

A valuation report or engineering appraisal is necessary to substantiate a value for a rock property. For the purpose of depletion alone it is essential that a careful study be made and a valuation report prepared based upon geologic, economic and engineering principles.

Various factors have led to the realization that the business of natural resources must be inventoried. A great part of the clamor raised over Federal taxes has not been due so much to the amount of these taxes as the fact that they are based upon net income. Industry, and particularly industry dependent upon mineral resources, oftentimes does not know the amount of its net income.

Modern business and accounting and today's balance sheet must be based upon something more than mere columns of figures. A few years ago the principal desideratum of a balance sheet was that it balanced. Today it must depict the true condition of the business. Industry must answer, and answer correctly, many questions which only investigation involving engineering, economics, geology and accounting can solve. Surprising as it may seem, the engineer, the economist, the geologist, the appraiser and the auditor are today called upon to work together. The result of this team-work properly directed is a valuation report or engineering appraisal for many and varied purposes.

Engineering Appraisals

These valuation reports and engineering appraisals are used for establishing rates of depletion and the substantiation of invested capital. They are required to secure bond issues, loans, and as a basis for sales. They are necessary to prove amortization of war facilities and are particularly useful in cases of reorganization. Many industries demand such reports to expose the true state of their business activities or for purposes of Federal or State taxation.

Recognition of the importance of this field of endeavor has given rise to a new activity—Valuation Engineering.

In a brief outline of this nature it is not possible to more than touch upon the scope and nature of valuation reports. These reports are made for such a variety of purposes and cover such a wide field of natural resources that each industry and property presents its own peculiar problem. The same general principles and procedure, however, are followed in all cases.

Factors in Making Appraisals

First, there are certain physical elements which must be presented by the engineer. These involve quantity and quality. Of what is the plant built and how it is constructed and what is the capacity. He measures distances, weights and computes strength of materials.

The chemist may be called upon to assay ores and analyze raw materials.

The economic geologist computes ore reserves, extent of overburden, traces the deposit, predicts future yield and makes other surface and underground geologic studies. How many ounces of silver, how many barrels of oil, how many tons of limestone, how many yards of gravel are contained in the deposit.

The appraiser of today considers a project entirely from the standpoint of its adaptability to the purpose which it serves. Its value is determined by the cost of producing a structure which will furnish modern conveniences and facilities for the purposes for which the project is intended, bearing in mind the type, construction and general architectural features of the project to be appraised. From this resultant cost is deducted the expense of making repairs and improvements to the existing project to such an extent that it will be equal in convenience and facilities to a project constructed under present day methods. The resultant figure is the fair value of the project appraised.

The valuation engineer treats of value. He must translate the physical facts into economic ones. The minute the word "value" is used, a field is entered in which the average engineer and geologist are not particularly at home.

The auditor takes the final results and figures and applies them to the books, the balance sheet and the tax returns in order to properly picture the true condition of the business. He determines invested capital and its reduction through sustained depletion and depreciation. He sets up property surplus and computes realized appreciation.

After reading this article, the operator in whose interest it is written may feel that he knows little more about the subject than when he started, but it is clearly impossible to more than outline the various factors involved and specific cases are frequently comparatively simple of solution. Nearly all producers of rock products are familiar with Form F (revised) and it is well to state that the principal feature of this form consists of Exhibit A or the valuation report. Schedule I covers the cost of the property. Schedule II is the allocation of the valuation as determined by an engineer's report, while Schedule III treats of the question of depreciation.

Notwithstanding the fact that the entire subject of valuation is more or less intricate, it may be applied very simply to most mineral deposits if one is familiar with recognized practice in such cases.

GLOSSARY OF VALUATION TERMS

The following valuation and economic terms are defined as used by us in our Valuation Reports and Engineering Appraisals:

VALUE. Means not only exchange value in dollars, but may properly be used to measure utility. The utility of such an unexchangeable article as the human hand is measured in dollars for the purposes of award or compensation. There can be but one correct amount for any particular value, but there may be several different values for the same commodity.

FAIR. The word "fair" implies justice.

FAIR MARKET VALUE. Is the amount of money which would induce a sale as between a willing seller and prudent purchaser; provided both seller and purchaser possess enlightened knowledge as to the particular commodity changing hands.

SERVICE VALUE. As applied to mineral deposits this term has somewhat the same meaning as "intrinsic value," excepting that it is a broader term and includes the extrinsic factor of availability. It therefore may be defined as the value due to quantity, quality, and location, irrespective of ownership or management. To use a marine expression, it is the "as is and where is" value. It exists regardless of earnings.

GOING VALUE. Also known as "Going concern" or "Going concern value." It relates to establishment of earnings and may accrue in addition to and over-and-above "Service Value." The wise exploitation of a mineral deposit for profit results in a certain going value accruing to such deposit through actual monetary returns.

UTILITY. Implies principal use. Its value is measured by its suitableness for the service intended.

POPULAR DEMAND. Is used in its ordinary meaning. It is applicable to mineral deposits on account of the insistence of the trade for certain recognized brands or descriptive appellations. For example, certain marbles, precious stones and mineral products under trade names have become so popularized that proper consideration of this fact is essential to a fair valuation.

Asbestine, celite, scouring powder, green slates, Vermont, Tennessee, or Georgia marble, and Mexican opal are a few examples of real or fancied superiority possessed by mineral products from special localities or sold under popular names.

ECONOMIC INJURY. Results when a portion of a valuable mineral deposit is removed or depleted. Such economic injury is suffered irrespective of appreciated value due to enhanced real estate prices or other extrinsic influences. A valuable deposit of kaolin is "economically injured" through depletion notwithstanding the fact that the building of a new railroad has enhanced the total value of the property. The value of the deposit itself has sustained depletion.

MINERAL RIGHTS. The property interest of one who pays a periodical rental to the owner of the property for the privilege of quarrying or exploiting a mineral deposit.

MINERAL FEE. The ownership of the mineral alone. It does not include fee title to the surface.

DEPRECIATION. Means the gradual reduction in the value of property due to physical deterioration, exhaustion, wear and tear through use in trade or business.

OBSOLESCENCE. Means the gradual reduction in the value of property due to the normal progress of the art in which the property is used, or to the property becoming inadequate to the growing needs of the trade or business. Obsolescence, a gradual lessening of value, must be distinguished from "loss of useful value," which contemplates an abrupt termination of usefulness.

LOSS OF USEFUL VALUE. Results when through some change in business conditions the usefulness of the asset is suddenly terminated. Thus, the physical equipment of a mine may lose its useful value through the unexpected encountering of unfavorable geologic conditions.

AMORTIZATION. Applies particularly to those facilities constructed wholly or in part to produce articles for the prosecution of the great war. For example, a cotton mill constructed under war prices or built over-size in anticipation of a long usefulness may be subject to amortization, wholly or in part. The term is also used to express the "writting off" of certain amounts over the useful life of the asset. For example, the amorization of the amount or bonus paid for a leasehold covering a definite period.

DEPLETION OR DEPRECIATION ALLOWED. Are the amounts allowed as deductions from gross income based upon the depletion or depreciation suffered during the taxable year.

DEPLETION OR DEPRECIATION SUSTAINED. Are the amounts necessarily deducted from invested capital or cost on account of depleting or depreciating the mineral deposit or physical property from date of acquisition. It is a recognition in audit of what actually happens.

MINERALS. Comprise ores of the metals, coal, oil, gas and the various inorganic nonmetals.

ORE. The substance of a commercially significant mineral deposit formed by mineralizing agencies of some special localized character.

MINE. A commercial deposit of mineral irrespective of method of recovery.

MINERAL PROPERTY OR "PROPERTY" includes mineral deposit, plant and equipment, development, and the surface value of the land. The value of a mineral property is the sum of the values of its component parts.

MINERAL DEPOSIT OR "DEPOSIT." refers to minerals only, such as "ores only" in the case of a mine, "mineral only" in the case of an inorganic nonmetal, "oil only" in the case of an oil well, and to "gas only" in the case of a gas well.

DISCOVERY. Is not applied to extensions of known deposits or ore bodies. It may be defined not only as a discovery of a new mine or deposit not previously known to exist but the discovery of the true nature of a known deposit. The utility of a deposit may be discovered as well as its physical presence. For example, a deposit of "clay" or "dirt" may be discovered to be high grade Fuller's earth. There is no advantage in knowing that a deposit exists if ignorant of its true character.

BASIC DATE OR "SIGNIFICANT DATE" means the date of valuation such as March 1, 1913, date of acquisition, date of re-organization, or date of discovery, or within thirty days thereafter.

NET OPERATING PROFIT. Is the profit per ton or other unit derived from operations before deducting depletion, depreciation and interest on borrowed capital.

IN GENERAL

The value of a mineral deposit comprises two main elements; an intrinsic element based on the qualities of the material itself and an extrinsic element based on its availability and the nature of the demands for it. These elements may not be sharply separated and neither exists without the other. The ratio of these two elements varies according to the bulk and unit value of the material and its immobiilty.

Tolerance of Sand in Coarse Aggregates

AS THE RESULT of an investigation made by the Bureau of Public Roads, states W. K. Hatt, director of the Highway Research Committee, Division of Engineering, of 1:2:3, 1:2:4 and 1:2:6 concrete, using in each case both a fine and a coarse sand as the fine aggregate, the following facts have been ascertained:

In the case of the material used for 1:1½:3, 1:2:3 and 1:2:4 proportions, 15 per cent tolerance may be allowed without substantially reducing the concrete strength; that the difference in the amount of water necessary to bring the mixer to the same workability will not disturb the mixing operations. The 1:3:6 proportion was too harsh with such a sand increase.

Both gravel and sand were taken from Indiana beds and a mixture of three brands of portland cement was used. The test methods were those recommended by the American Society for Testing Materials except that paraffined paper molds were used. The concretes were brought to the same consistency as measured by the flow table—approximately not more than 6 per cent—and the mix was by volume.

Maximum strength was reached with 5 per cent of tolerance material, with a decreased strength with increasing tolerance beyond 5 per cent. The following decrease was noted at 15 per cent tolerance from the strength at zero tolerance:

	Per cent.
1:1¼:3	0
1:2:3 coarse sand	5
1:2:3 fine sand	0
1:2:4 coarse sand	10
1:2:4 fine sand	9
1:3:6 fine sand	10
1:3:6 coarse sand	12

Benefits Derived from Corporate Ownership

Legal Phases of Business Administration

IT IS A MATTER of common knowledge that the tendency at the present time is to conduct business under corporate ownership, rather than as a partnership or under individual ownership. The reason for this tendency is readily understood by those who are familiar with methods of business administration under both corporate and individual ownership.

The three most desirable features in the conduct of a business are: (1) Limited liability of the members of a business; (2) the right of perpetual succession; (3) the facility of assembling large amounts of capital in the hands of a single entity.

The first two of these features are not to be obtained except as a part of the corporate organization, and the third feature is very rarely obtained by the individual or partnership.

Limited Liability

Stockholders have, in most states, no liability beyond what is known as the subscription liability. If a stockholder subscribes for shares of the corporation's stock and does not pay the amount of his subscription in full, the creditors of the corporation can usually compel payment of the unpaid balance, in case the corporation becomes insolvent. Or if a corporation accepts subscriptions for less than par, corporate creditors can usually collect the difference to render the stock full-paid.

A corporation and its stockholders are distinct persons or parties. If a man owns one share or all the stock of the corporation, he is not the corporation. Many business men form an idea that because they own all or most of the capital stock of their corporation, they are the corporation. They are not. They are so distinct that if they loan money to the corporation they become creditors with the right to sue the corporation. If they were the corporation itself they could hardly sue themselves.

In the case of individual ownership or a partnership there is no limited liability. A partnership is merely a number of individuals, each one of whom represents the partnership fully, may make contracts for it without consulting the other partners, and can bind it by his action. This is so despite the fact that all the partners are held equally liable, and may even be opposed to the action of the one partner. A partner cannot contract with his partnership, bring suit against it or be sued by it.

An individual in business is liable for all his business debts, even though his private fortune may be required to liquidate his indebtedness. On the other hand, if he incorporates his business and takes in payment shares of stock to the net value of the assets turned over to the corporation, he then controls the affairs of the corporation, holding full-paid stock, and he is not personally liable for the debts of the corporation should it become insolvent.

It must be understood, however, that an officer or director of a corporation may become liable for the debts of the corporation if he specifically states that he will assume such liability for the corporation.

Perpetual Succession

A partnership is necessarily dissolved if a partner dies, no matter how much embarrassment or loss this may cause the remaining partners. If an individual dies it is sometimes possible for his heirs to arrange to continue the business, but very frequently it is not. A partnership may be dissolved at any time at the will of any partner.

A corporation, on the contrary, is not disrupted if one of the stockholders or officers dies, becomes insolvent, or sells his stock. The stock will merely be transferred to another person, and without necessarily affecting the affairs of the corporation. A corporation continues for the term of its existence, regardless of the ebb and flow of the fortunes of its stockholders, or how many times the stock of the corporation may change ownership.

Assembling Capital

The comparative ease with which large amounts of capital may be obtained designates the corporate organization as the logical form for business enterprises whose aim is to expand to the greatest possible extent. The individual or partnership has very limited means of obtaining capital for expansion, while the corporation may issue stocks, bonds and other forms of negotiable securities.

Corporate Powers

An individual or partnership may do anything and transact business of any nature not expressly forbidden under the law. A corporation, however, may do only those things for which it was organized and which it is permitted to do under its charter.

The special powers of a corporation are mentioned in the charter, and include the purpose for which it was formed. In addition to the special powers granted by the charter, a corporation also has general powers, and these include the right to do all things necessary to conduct the business for which the corporation was organized.

A corporation might be organized for the purpose of conducting a retail business only. It would be beyond the powers of such a corporation to engage in a manufacturing business, and should it do so the charter might be forfeited, or it might be restrained from continuing the part of the business for which it had no authority. However, a charter may be amended, and a corporation may thus obtain powers which it did not possess when first organized.

Concrete Products in a City Department Store

THE GREAT STRIDES made by concrete products is evidenced in many ways. One of the most interesting is the sale of concrete lawn and garden furniture by city department stores.

"Granite Cement" Furniture for the Garden

BECAUSE of the peculiar texture of the cement used in these pieces, it is polished to a close resemblance of granite.

The Bench, a graceful piece of Furniture which will be an ornament to any garden, as well as a welcome resting place, is $22 in the 48-inch size. The same Bench, 54 in. long, is $27.50.

The Sun Dial Pedestal, well turned and substantial, stands 37 inches high and sells for $18. Bronze dial, $7.50.

Second Floor, Arbutus Section, Wabash Avenue

The cut herewith is taken from an advertisement of Marshall Field & Co., Chicago, in a local newspaper.

Incidentally it is of interest to know that these particular concrete products were made at Mooseheart, an institution maintained by the Loyal Order of Moose, a national fraternal organization. This is a home and training school for boys and girls—an orphanage.

Editorial Comment

Lime Dust and Tuberculosis

Has lime and limestone dust a beneficial effect on tuberculosis sufferers? Rock Products believes the subject worth a thorough investigation. During the last few weeks the editors have made quite a canvass of the industry for the experience of the various producers. A surprising amount of interest has been displayed and a valuable amount of data accumulated.

The information contained in these letters is being summarized and will be published in an early issue. As soon as this is done the letters will be turned over to the National Tuberculosis Association, the Industrial Research Department of which has already expressed great interest in the subject.

Any readers who have had experience with employes suffering with tuberculosis are urged to communicate at once with the editor so that the data turned over to the National Tuberculosis Association may be complete.

One important fact that may be developed by this investigation is the almost total absence of tuberculosis among the workers in lime and limestone plants. This is important because all the present statistics on the subject group lime and limestone workers with workers in cement, silica, granite and other stone-grinding or stone-cutting industries, where the dust contains considerable quantities of silica. The effect of silica dust is vastly different from that of limestone dust.

Winter Construction

All signs point to a more than normal volume of winter construction. The agitation started by Secretary Hoover's Conference on Unemployment, and the genuine need for many kinds of structures, particularly dwellings of various kinds, school houses and municipal public works, are some of the reasons why many contractors who have not heretofore attempted to do much during the freezing weather are now contemplating operating all winter, provided materials can be had.

The problems of operating a sand and gravel washing plant in very cold and snowy weather are just about insurmountable, except possibly in dredging, or pumping operations, where the screening plant could be partly protected from the weather and heated by salamanders or some other temporary expedients.

A dry sand and gravel screening proposition or a quarry operation does not present any difficulties which can not be overcome in any winter weather except when there are deep snows. The Janesville, Wis., gravel plants are operated all winter, as are many quarries.

However, the simplest solution of the winter aggregate-supply problem is ground storage. Sand and gravel made during the summer months and put into ground storage piles readily dries out and can often be rehandled in the coldest weather without any difficulties, unless rained on during transit. Many plant operators have already learned the advantages and profit of a winter stock pile, and this winter is likely to prove more than ever the wisdom of it.

Record Cement Production

This year of 1921 will evidently see all records for portland cement production broken. Even the 1920 record of over 100,000,000 bbls. will be exceeded. More than that there is reason to believe that the United States has permanently passed the 100,000,000 bbl. mark. The bulk of this year's production has evidently gone into concrete highways. The volume of house building has been fair, but ordinary home construction does not require the use of very much portland cement. The volume of office and industrial buildings, which usually absorbs a considerable proportion of cement production, has been low, while the volume of railway bridge building and like structures has been practically nil. Neither has there been a normal amount of city pavement construction and public works.

In the next few years to come there is every reason to believe that the present volume of road building will continue or even increase, while it is obvious that municipal paving and public works, and railway improvements must soon be undertaken in greater volume than ever before. There is therefore some foundation for believing that not only has the 100,000,000-bbl. production mark in portland cement production been passed, but there are many indications that production will continue to climb uninterruptedly toward the second 100,000,000.

Annual Review Issue

Subscribers of Rock Products are giving splendid co-operation in furnishing material for our annual summary of conditions in the rock products industry. Some complain that our questionnaire contains questions that no human being can answer. That's right. But you can hazard a guess or an opinion. The summary of many opinions from those in the industry certainly is interesting and ought to have some weight and value. Every producer has his own opinions or he could not plan his work ahead. So let's have them and see if a general interchange of ideas isn't a real help in arriving at your own final estimate.

The date of the annual review number has been changed from December 31 to January 14, so there is still lots of time to fill out your questionnaire, or better still mail us a line on what you think about the conditions to be faced by the industry in 1922. We want to make this January 14 issue the best ever.

Accident Prevention

Fire Causes and Prevention

No. 3—Prepared by the Engineering Department of the National Safety Council

Portable and Pendant Cords

Portable and pendant lamps are frequent causes of fire because of defective insulation. Sometimes the cords have been hung on nails or other metal objects and through continual vibration are worn until contact is made, and a short circuit results. Ordinary lamp cords are often used in a wet place and become soaked with water, thus causing a short circuit. Rubber insulation deteriorates with time, and the cord must be renewed. Portable lamps should be used only when absolutely required such as for purposes of cleaning out boilers, entering manholes and the like, and then only heavy reinforced cords should be employed so as to withstand wear and prevent short circuiting. Water-proof cords and sockets are necessary where exposed to dampness. Pendant lamps (drop cords) are not advisable and should not be used when a permanent, rigid fixture can be installed. Wherever pendant lamps are used, the cord should hang vertically from the supporting fixture and never be hung over nails, machine parts or other objects.

Heating Apparatus

Probably the most frequent causes of fire from heating apparatus are defective flues and loose joints or dust holes in smoke pipes are examples of such defects. These are responsible for practically all fires which originate in walls or in partitions around smokestacks and flues. All chimneys should be thoroughly inspected and cleaned at least once each year. Smoke pipes should be carefully inspected in the fall before the first fire is built, to make sure that the joints are tight and that rust has not eaten away the pipe so that it is unsafe. Occasional inspection thereafter is also advisable.

Protection of Woodwork—Woodwork near furnaces, stoves and smoke pipes should be protected either by covering the heating apparatus or pipe, or by interposing a metal or asbestos sheet placed about 3 in. from the woodwork. The space behind such a shield should always be kept clear to permit free air circulation.

No metal smoke pipe should be placed nearer to any combustible wall or partition than the diameter of the pipe, nor nearer any combustible ceiling than 1½ times the diameter, unless such wall partition or ceiling is protected by asbestos board or sheet metal.

Overheated Stoves—It is not infrequent in many industrial plants to find small offices in various departments heated by coal or wood stoves. These offices are apt to accumulate rubbish and papers, including various shop forms, and often present serious fire hazards, because of their wooden construction, the inflammable material in them, and because they are frequently used as a sort of shop smoking room. Fires occasionally result in such rooms when the stoves are filled with fuel, and all persons leave the room temporarily. The overheated stove sets the surrounding woodwork on fire, or the red hot smokepipe ignites the wall or ceiling.

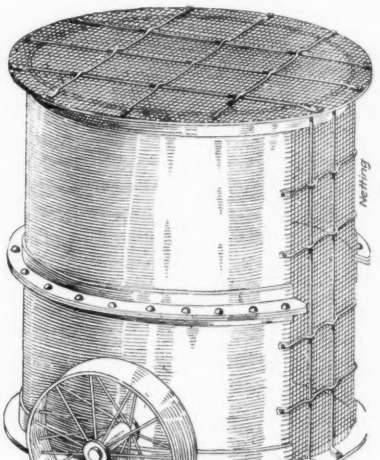
(To be continued)

Safeguarding Surface Blasting

IN PUTTING through an approach to the Mesabi Mountain mine of the Oliver Iron Mining Co., at Virginia, Minn., the "tank" shown below was used to prevent damage from frozen chunks of earth, small boulders and dirt thrown up by the surface blasts.

The ground was composed principally of glacial till, which ordinarily offers little resistance to the steam shovel. Most of the work, however, was done in the winter, under extreme temperature conditions, and as the frost extended to a depth of 6 ft. in places, it was necessary to drill blasting holes ahead of the shovel. Before blasting the tank was rolled over the holes.

This tank, which was mounted on iron wheels, was made from one of the blasting or shelter houses used in open pits on the Mesabi Range to provide safety for the men. They are circular in shape, made of steel plate, provided with a conical roof, and are ordinarily placed at various points so that workmen may take refuge in them during blasting. To convert the shelter into a blasting tank the conical top was removed, ¼-in. mesh iron screen substituted for it and 1½-in. bars were bolted to the outer rim. Similar bars, threaded and bolted on the outside, were placed about a third of the way down from the top, these serving to reinforce the tank. Screening, also reinforced, was placed over the entrance of the former shelter.—*Engineering and Mining Journal.*



A "tank" safeguard on blasting

Will Not Hire Careless Men

AS AN advance precaution against hiring men who are careless and indifferent to the means given them to avoid accidents in their daily work, a superintendent of a large plant has caused this notice to be placed prominently in the employment office of his company:

"Notice to Men Seeking Employment—Unless you are willing to be careful to avoid injury to yourself and fellow workers, do not ask for employment. We do not want careless men in our employ."

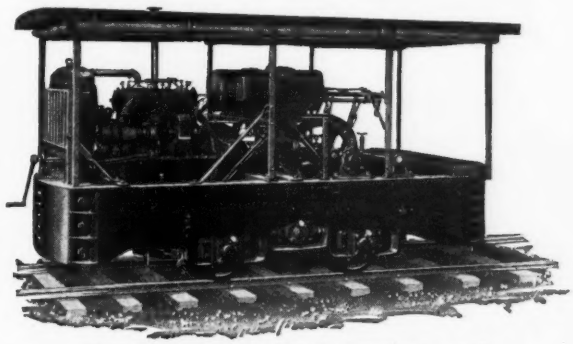
Such measures are highly commendable, and this practice of warning those seeking employment should be generally adopted.

New Machinery and Equipment

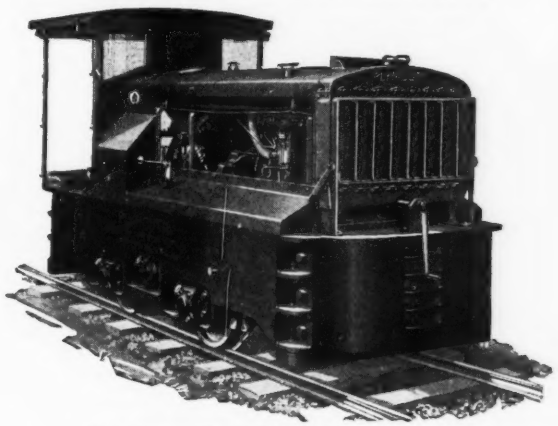
New Industrial Gasoline Locomotive

A NEW industrial gasoline locomotive is announced by the Fate-Root-Heath Co., Plymouth, Ohio, to be known as model CL, 3½-ton, and will be supplied in the two types illustrated.

Type 2 has a cab with drop curtains for enclosure during inclement weather, with a hood covering the engine and the transmission. Type 3 has a canopy with drop curtains which can be rolled for open season work or in warm climates, allowing the driver unobstructed view.



New Plymouth gasoline locomotive, type 3



New Plymouth gasoline locomotive, type 2

Both types are equipped with powerful, heavy-duty Buda engines, extra large radiators with Modine sectional cores, and are protected by heavy steel guards. The drive shaft is carried on two bearings, and a double width chain on the main drive insures not only an extra margin of strength but minimizes link breakage. The frame is extra heavy, with low hanging bumpers, protecting the chain and sprockets in case of track obstructions or derailment.

The manufacturers say that this new model is a marked step forward in meeting the requirements disclosed by the ever-expanding industrial fields and in which the Plymouth has played its part.

Model 21 Gasoline-Electric Shovel

A NEW gasoline-electric shovel has been put on the market by the Marion Steam Shovel Co., Marion, Ohio. It has a direct-connected generating set and consists of a four-cylinder, vertical, heavy-duty gasoline engine, with Bosch magneto, Stromberg carburetor and bronze water pump.

Current is had from the 23-kw. generator. Three controllers are used for hoisting, rotating and crowding. These machines will handle hard material at the same speed as a steam machine. The enclosed motors are rigidly mounted and do not interfere with the drums, bearings and shafts. The machine can be converted into a steam outfit if desired.

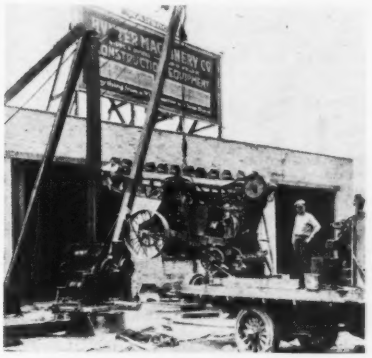
At the front of the upper frame is the motor-driven, direct-connected air compressor to operate the hoisting ram and pressor is automatic and many of the self-locking crowding brake. The compparts of the shovel are interchangeable.

This shovel works with all the vigor of the steam machine, with little if any noise, and does away with the cost of a fireman, coal and water.

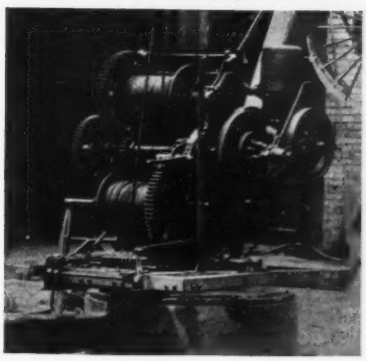
Derricks Operated by Novo Engine

IN ORDER to more easily handle the loading and unloading of heavy machinery at its warehouse, the Hunter Machinery Co., which distributes Novo gasoline engines at Milwaukee, Wis., designed the derrick rig shown here.

The derrick has a capacity of 5 tons, sufficient to handle any machinery carried by the company, and it is operated by a 3 h.p. Novo engine. The wagon loader weighs 4½ tons and it is also operated by a Novo engine.



Novo engine on derrick



"Close-up" of Novo engine rigged to derrick

A similar rig could be used in warehouses, on docks, in marble works, in railroad yards and in other places where it is desired to handle heavy loads. The Novo engine is particularly adapted to this type of rig because of its compact, vertical design. It is manufactured by the Novo Engine Co., Lansing, Mich.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:	1.50 per net ton all sizes—Winter prices from stock					
Buffalo, N. Y.	1.00	.....	2.50	2.00	2.00	.....
Burlington, Vt.	1.00	1.75	1.75	1.25	1.25	1.25
Chaumont, N. Y.	1.25	1.25	1.15	1.15	1.15	.....
Cobleskill, N. Y.	1.50 per net ton, all sizes					
Coldwater, N. Y.	.75	1.60	1.60	1.60	1.60	1.50
Eastern New York	1.00	1.75	1.75	1.50	1.50	1.50
Eastern Penna.	.70	1.15	1.15	1.15	1.15	1.15
Munns, N. Y.	1.00	.....	1.60	1.60	1.60	1.60
Walford, Pa.	.70	1.25	1.25	1.25	1.25	1.25
Western New York						
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	.....	1.50	1.35	1.35	.....
Bettendorf, Ia.	All sizes, 2.00 cu. yd. f.o.b. quarry					
Buffalo, Iowa	1.00	1.30	1.40	1.20	1.25	1.30
Chicago, Ill.	1.00	1.40	1.00	1.00	1.00	1.00
Dundas, Ont.	1.00	1.50	1.50	1.50	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	.....
Faribault, Minn.	.....	.....	.....	.....	2.00	.....
Greencastle, Ind.	1.00@1.25	1.25	1.00	1.00	1.00	1.00
Illinois, Southern	1.75	1.60	1.50	1.50	1.40	.....
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.40	1.25	1.25	1.10	1.10	1.10
Lannon, Wis.	.90	1.00	1.00	1.00	1.00	1.00
Marblehead and Brillion, Wis.	1.10	.....	1.20	1.10	1.10	.....
Montrose, Ia.	1.35@1.50	1.60	1.50@1.60	1.60	1.50	1.50
Oshkosh, Wis.	1.40 per ton, all sizes					
Sheboygan, Wis.	1.05@1.30	1.00	1.00	1.00	1.00	1.00
Southern Illinois	1.50	1.40	1.40	1.40	1.30	.....
Stolle, Ill. (I. C. R. R.)	1.55	1.55	1.55	1.30@1.35	1.50	1.50
Stone City, Iowa	.50	.....	1.40	1.35	1.30	.....
Toledo, Ohio	1.84	1.99	1.99	1.99	1.84	1.84
Toronto, Canada	1.90	2.40	2.40	2.15	2.15	2.10@2.15
Valmeyer, Ill.	1.60	1.30	1.30	1.30	1.30	1.30
SOUTHERN:	These prices include 90c freight					
Cartersville, Ga.	.....	2.00	.....	1.25	1.25	.....
Chickamauga, Tenn.	1.10	1.00	.....	1.00	.93	.....
Dallas, Texas	1.10	1.25	1.25	1.25	1.25	1.10
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Fort Springs, W. Va.	1.35	1.65	2.00	1.60	1.50	1.45
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	1.25	.....	.....	1.25	1.25	1.25
Morris Spur (near Dallas) Tex.	1.10	1.25	1.25	1.25	1.25	1.25
Portland, Ga.	.60@1.00	(All other sizes 1.00@1.25)				
Shephard, Tenn.	1.00@1.25	1.00@1.25	1.00@1.25	.75@1.00	.75@1.00	.....
WESTERN:						
Atchison, Kans.	.50	2.10	2.10	2.10	2.10	2.10
Blue Springs and Wymore, Neb.	.20	(Rip-rap. 1.65	1.65	1.80 per ton) 1.55@1.60	1.45@1.50	1.40
Bromide, Okla.	.60	1.50	1.50	1.50	1.30	1.30
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	1.80	2.00	2.00	2.00	2.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.60	1.50	1.25	1.15	1.10	.....
Bound Brook, N. J.	2.00	2.30	2.00	1.70	1.60	.....
Dresser Jct., Wis.	1.25	2.25	2.25	2.00	1.65	1.75
Duluth, Minn.	.75@1.00	2.25	1.90@2.00	1.35@1.50	1.35@1.50	1.35@1.50
Dwight Station, Calif.	.75@1.00—all sizes					
E. Summit, N. J.	2.10	2.35	2.15	1.75	1.75	.....
Eastern Mass.	.60	1.95	1.75	1.50	1.50	1.50
Eastern New York	1.00	1.80	1.70	1.50	1.50	1.50
Eastern Penna.	1.25	1.90	1.80	1.60	1.50	1.50
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	60@ .80	1.60@1.75	1.50	1.25	1.10	.....
Oakland, Calif.	1.75	1.75	1.75	1.50	1.50	1.50
Richmond, Calif.	.50*	.....	1.75*	1.50*	1.50*	.....
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	2.00	2.25	2.10	1.85	1.85	1.85
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Alexandria Bay, N. Y.	1.60	.....	1.30	1.50	1.20	.....
Columbia, S. C.—Granite	.75	.....	2.75	2.50	2.35	.....
Dell Rapids, S. D.—Granite	.75	2.00	2.10	2.10	1.60	.....
Dundas, Ont.—Flint	1.00	1.50	1.50	1.50	1.25	1.20
Eastern Penna.—Sandstone	1.00	1.75	1.75	1.50	1.50	1.50
Eastern Penna.—Quartzite	.90	1.60	1.40	1.30	1.30	1.30
Holton, Ga.—Granite	.40	.....	2.50	2.25	2.25	2.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Macon, Ga.—Granite	.50	.....	2.50	2.25	2.00	1.25@1.90
Middlebrook, Mo.—Granite	3.00@4.50	.....	.....	2.25@2.80	.....	1.50@1.75
Red Granite, Wis.	1.35	1.40	1.30	1.50	1.20	.....
Sioux Falls, S. D.—Granite	.75	2.00	2.00	2.10	1.60	.....
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	.....
Utley, Wis.	1.35	1.40	1.30	1.50	1.20	.....

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk 2.50

Coldwater, N. Y.—Analysis, 56.77% $CaCO_3$, 41.74% $MgCO_3$, 70% thru 200 mesh, 95% thru 50 mesh, sacks 4.00; bulk 3.00

Grove City, Pa. — Analysis, 94.75% $CaCO_3$, 1.20% $MgCO_3$ — 70% thru 100 mesh; 80 lb. ppr., 5.50; bulk..... 4.50

Hillsville, Pa.—70% thru 100 mesh; sacks, 4.75; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.50; bulk 2.75

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Texas, Md.—Analysis, 58.02% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

Waltord, Pa. — 50% thru 100 mesh, 60% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk..... 3.00

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 5.00—cloth, 5.25; bulk 3.50

Williamsport, Pa. — Analysis, 88-90% $CaCO_3$, 3-4% $MgCO_3$—50% thru 50 mesh; paper, 4.75; bulk..... 3.50

CENTRAL:

Alton, Ill. — Analysis, 96% $CaCO_3$, 0.3% $MgCO_3$—90% thru 100 mesh 8.00

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh ..... 1.60@2.00

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Bettendorf, Ia.—Analysis, 96.14% $CaCO_3$, 2.5% $MgCO_3$—50% thru 100 mesh, 2.00; 50% thru 4 mesh..... 2.00

Buffalo, Ia.—90% thru 4 mesh..... 1.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$ (90% thru 50 mesh, 2.00), 50% thru 4 mesh..... 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh.... 1.00

Columbia, Ill., near East St. Louis—¼-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh..... 2.00

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh..... 1.40

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh..... 2.00

Marblehead, O.—Analysis, 33.42% $CaCO_3$, 4.29% $MgCO_3$—52.4% thru 100 mesh, 59.4% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk..... 3.00

Limestone screenings; bulk..... 1.50

McCook, Ill.—Analysis, 54.10% $CaCO_3$, 45.04% $MgCO_3$—100% thru ¼-in. sieve, 78.12% thru No. 10, 53.29% thru No. 20, 38.14% thru No. 30, 34.86% thru No. 50, 22% thru 100 ..... 1.50

Milltown, Ind. — Analysis, 93.10% $CaCO_3$, 3.2% $MgCO_3$—33.2% thru 100 mesh, 40% thru 100 mesh..... 1.25@1.65

Mitchell, Ind.—50% thru 100 mesh..... 2.00

Montrose, Ia.—90% thru 100 mesh..... 1.35

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh..... 1.50@2.00

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

Piqua, O. — Analysis, 82.8% $CaCO_3$, 8.2% $MgCO_3$; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh..... 3.25@5.00

50% thru 50 mesh..... 1.75@2.00

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R. — Thru ¼-in. mesh — Analysis, 89.61% to 89.91% $CaCO_3$, 3.82% $MgCO_3$ 1.75

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 100 mesh..... .50

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh 1.50

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Whitehill, Ill. — Analysis, 97.12% $CaCO_3$, 2.50% $MgCO_3$ — 90% thru 100 mesh 5.00
50% thru 100 mesh 1.50
Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk.... 4.25
SOUTHERN:
Barber, Va.—Analysis, 92 to 98% $CaCO_3$—Bags, 6.50; bulk..... 4.50
Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh..... 4.75
Cartersville, Ga.—Analysis, 96% combined carbonates — pulverized limestone ..... 1.75@2.00
Claremont, Va. (Marlime) — Analysis, 90% $CaCO_3$, 2% $MgCO_3$—(90% thru 100 mesh, $4.00), 50% thru 100 mesh 3.50
Dittlinger, Tex. — Analysis, 99.09% $CaCO_3$, .04% $MgCO_3$—90% thru 100 mesh ..... 2.00@3.00
90% thru 4 mesh ..... 1.00@2.00
Ft. Springs, W. Va.—50% thru 100 mesh 3.00
Grovania, Ga.—Analysis, 95% $CaCO_3$, no $MgCO_3$—50% thru 100 mesh..... 2.50
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh..... 2.00
90% thru 50 mesh..... 1.50
Ladds, Ga.—50% thru 100 mesh..... 2.00
Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk..... 3.00
Mascot, Tenn.—Analysis 52% $CaCO_3$, 38% $MgCO_3$.
80% thru 100 mesh..... 3.00
All thru 10 mesh..... 2.50
80% thru 200 mesh..... 4.50
Paper bags, $1.50 extra per ton; burlap, $1.00 extra per ton.
Maxwell, Va. 2.50
Ocala, Fla. — Analysis, 98% $CaCO_3$—75% thru 200 mesh..... 4.50
WESTERN:
Colton, Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all to pass 14 mesh; bags, 6.50; bulk 4.50
Sacks, 15c extra, returnable.
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh ..... .50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk..... 1.80
Terminous, Calif. — Analysis, 97.3% $CaCO_3$, .04% $MgCO_3$—65% thru 200 mesh, 90% thru 100 mesh, 95% thru 80 mesh, 100% thru 50 mesh; sacks, 5.00; bulk 4.50
Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:
Baltimore, Md. ..... 2.25@2.75
Berkley Springs, W. Va..... 2.00@2.25
Cedarville and South Vineland, N. J.—
Damp 1.75
Dry 2.25
Cheshire, Mass. ..... 5.00@7.00
Hancock, Md.—Damp ..... 2.50@3.50
Klondike and Pacific, Mo..... 2.00@2.50
Mapleton, Pa.—Dry 2.50
Damp 2.00
Massillon, Ohio 3.00
Millington, Ill. 1.75
Mineral Ridge, Ohio ..... 2.50@2.75
Montoursville, Pa.—Green, washed..... 1.40@1.75
Oregon, Ill.—Large contracts..... 1.75
Ottawa, Ill. ..... 1.25@1.50
Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00
Rockwood, Mich. ..... 3.00@3.50
Round Top, Md.—(washed-screened)..... 1.25
St. Mary's, Pa.—Unwashed..... 2.25
Thayers, Pa.—Washed 2.00
Utica, Ill. ..... 1.25@1.75
Zanesville, Ohio 2.50
FOUNDRY SAND:
Albany, N. Y.—Sand blast..... 4.50@7.00
Molding fine, coarse and brass..... 1.75@2.00
Allentown, Pa.—Molding coarse & fine 1.50@1.75
Arenzville, Ill.—Molding fine..... 1.40@1.60
Beach City, O. — Core, washed and screened ..... 2.00@2.50
Furnace lining ..... 2.50@3.00
Molding fine and coarse..... 2.25@2.50
Bowmantown, Pa.—Core ..... 1.35@1.50
Molding, coarse ..... 1.80@2.00
Cleveland, O.—Molding coarse..... 1.50@2.00
Brass molding ..... 1.50@2.00
Molding fine ..... 1.50@2.25
Core ..... 1.25@1.50
Columbus, O.—Core ..... .40@1.25
Sand blast ..... 3.50@4.50
Furnace Lining 2.00
Molding fine ..... 1.50@2.25
Molding coarse ..... 1.50@2.25
Stone sawing 1.50
Traction ..... .40@ .75
Brass molding 2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	**.75**	**.75**	**.75**	**1.00**	**1.00**	**1.00**
Buffalo, N. Y.	1.10	.95				
Erie, Pa.		**1.00**		**1.15**		**1.25**
Farmingdale, N. J.	.48	.48	1.50	1.50	1.30	1.30
Hartford, Conn.	**.90**		**1.25**	**1.15**	**1.15**	**1.15**
Leeds Junction, Me.		.50	1.75	1.50	1.35	1.25
Ludlow, Mass.	**.75•**	**.75•**	**1.70**		**1.50•**	**1.50•**
Philadelphia, Pa.	.75	.75		1.40	1.25	
Pittsburgh, Pa.		1.30	1.30	1.30	.85	.85
Portland, Maine		.50	1.75		1.35	1.35
Texas, Md.		1.00		Pure white sand, 1.50		
Washington, D. C.	.60@ .75	.60@ .75	2.00	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.40	.40@ .50		.90		.90
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		.40	.40		.40	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.80@1.00	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	100@1.25
Des Moines, Ia.		.40@ .65	1.60	1.60	1.60	1.60
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.50	.50	1.00@1.25	1.00	1.00	
Elgin, Ill.		.80	1.00	.80	.80	.80
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.85	.75	.75
Greenville, Mechanicsburg, O.	.70	.60	.50	.60	.60	.60
Hawarden, Ia.	.70	.50		1.60		1.40
Indianapolis, Ind.	.60	.60		**1.50**	**.75@1.00**	**.75@1.00**
Janesville, Wis.		.65@ .75			.65@ .75	
Le Mars, and Doon, Ia.		.90		1.80		
Libertyville, Ill.		.70		.70	.70	
Mankato, Minn.	.50	.50	.75@1.50	.75@1.50	.75@1.50	.75@1.50
Mason City, Ia.	.90	.80	1.90	1.80	1.70	1.65
Milwaukee, Wis.	1.15	1.15	1.25	1.25	1.25	1.25
Minneapolis, Minn.	.35@ .50	.35@ .50	1.50	1.50	1.50	1.25@1.50
Moline, Ill	.50@ .70	.50@ .70	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Riton, Wis.		.40			.50	.50
St. Louis, Mo., f. o. b. cars	1.20	1.35	1.25	1.30	1.40	1.25
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Winona, Minn.	.60	.50	1.50	1.25	1.25	1.25
Yorkville, Moronts, Oregon and Sheridan, Ill.		.60@ .80	.70@ .80	.70@ .80	.70@ .80	.60@ .80
SOUTHERN:						
Alexandria, La.	.60@ .80	.50@ .75			.85@1.50	1.20@1.50
Birmingham, Ala.	1.48		all gravel—1.88			
Charleston, W. Va.			(Sand, 1.40@1.50; gravel, 1.50			
Estelle Springs, Tenn.	1.25	1.20	1.10	1.00	1.10	.85
Ft. Worth, Tex.		2.00		2.00		2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	1.15	1.15	2.12		1.92	1.74
Lake Weir, Fla.		.75				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.12	1.12				**1.95**
N. Martinsville, W. Va.	1.10	1.10		1.30		.90
New Orleans, La.	**.50**			**.85**	**.85**	
Pine Bluff, Ark.	.90@1.25	1.00@1.20	Washed gravel, all sizes, 1.75			
Roseland, La.	.25		1.00	1.00		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.10•	1.00•			1.50•	
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50•	1.50•	2.00•	1.50•		1.50•

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	**.75**
Boonville, N. Y.	.60@ .80		.55@ .75			**1.00**
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Ia.			.80 per ton—1.20 washed			
Detroit, Mich.	1.10•					
Dudley, Ky. (Crushed Sand)		1.05		1.00		
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.			Washed gravel .66			
Estelle Springs, Tenn.						.85
Fishers, N. Y.	.60	.65	.50	.65		.50
Glenville, N. Y.				1.00•		
Hamilton, O.			.45 per cu. yd. in pit			
Hartford, Conn.		1.00•				
Hersey, Mich.	.30	.50		.50	.85	.60
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Janesville, Wis.		.65			.65@ .75	
Lindsay, Tex.		2.00				.60
Oxford, Mich.				.65	.65	
Pine Bluff, Ark.			Road gravel .60			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f. o. b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.50			
Summit Grove, Ind.	.60	.60	.60	.60	.60	.60
Waco, Texas		.80		**1.50**		1.30
Winona, Minn.			.70	.70	.70	.70
Yardville, N. J.		**.50@ .75**				
York, Pa.	1.05	1.20		(crushed rock sand)		

•Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1¼ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Allentown, Pa.	2.25	.90	1.50	1.00	1.00	1.00	1.00
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	3.50	1.10	2.50	1.25	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Erie, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ironton, O.	2.40	1.75	Other grades 1.75				
Jackson, O.	2.00	1.35	1.70	1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	2.93	2.30	2.49	2.49	2.49	2.30	2.30
Youngstown, Dover, Hubbard, Leetonia, Struthers, Steubenville, Lowellville & Canton, O.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.00@1.25	1.15	1.05@1.10	.85@1.00	.85@ .90
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Va.	2.50	1.00	1.60	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN:								
Adams, Mass.			7.50					3.50
Bellefonte, Pa.			11.50		8.00			
Berkley, R. I.			14.00					
Buffalo, N. Y.		11.00	11.00	11.00			9.50	2.00*
Chaumont, N. Y.					2.50	4.00		
Paxtang and Le Moyne, Pa.					5.00		5.00@7.50	
Rockland, Maine						8.00		
Union Bridge, Md.			13.00		5.50			
West Stockbridge, Mass.			15.00					
Williams and Blue Bell, Pa.			11.25					
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa.		11.50	11.50	11.50			7.50	3.00‖
CENTRAL:								
Delaware, Ohio	10.50	9.00	8.00	9.50			8.00	1.60
Geneo, Ohio	10.50§							
Gibsonburg, Ohio	10.50§	8.50	8.50				7.00	
Huntington, Ind.	10.50	9.00	8.50				8.00	1.70*
Knowles and Valders, Wis.			12.50		5.00	9.00		
Marblehead, Ohio	10.50	9.00	9.00	11.00	7.50	9.50	8.00	1.70*
Mitchell, Ind.		12.00	12.00	12.00			9.00	1.75*
Sheboygan, Wis.					5.50	8.50		
White Rock, Ohio	10.50							
Woodville, O. (dlrs.' price)	10.50a	8.50a	8.00a	8.50a	7.50	8.00	8.00	1.70
SOUTHERN:								
El Paso, Tex.							12.50	
Knoxville, Tenn.	11.00	9.50	9.50				7.50	1.30
Sherwood, Tenn.	11.00	9.50	9.50	9.50	7.50		7.50	1.30
Staunton, Va.					8.00		9.50b	1.60
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. Mex.					12.00		15.00	2.00c
Los Angeles, Calif.			15.00‡				16.00	
San Francisco, Calif.	22.00		20.00		16.00		16.00	2.15*
Tehachapi, Calif.						15.00	20.30	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; ‖300-lb. bbl. §Paper sacks. a 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. b Burlap bags. c 200 lb. bbl.

Miscellaneous Sands

(Continued from preceding page)

Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Molding coarse	1.50@1.75
Brass molding	1.75
Dunbar, Pa.—Traction, damp	2.75
Dundee and Chalfants, O.—Sand blast	3.00
Glass, core and traction	2.75
Molding fine and brass molding	2.25
Furnace lining	2.50
Molding coarse	2.00
Falls Creek, Pa.—Glass sand	2.50
Furnace lining, traction and molding coarse	2.00
Sand blast	3.50
Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.00@4.25
Traction sand	.50
Franklin, Pa. and Utica, Pa.—Traction	2.50
Brass molding	2.25
Core	1.50@2.00
Molding fine	2.25
Molding coarse	2.00
Sand blast	5.00
Greenville, Ill.—Molding coarse	1.25@1.60
Howard, O.—Glass sand	3.00
Molding—Fine and coarse	1.75@2.00
Stone sawing	2.00
Core, roofing and brass molding	1.75@2.25
Sand blast	4.00
Furnace lining and traction	1.75@2.00
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and looting clay	.90@1.25
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and fine, stone sawing (pit run)	1.75
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Molding coarse	2.50@3.00
Mapleton, Pa.—Core, furnace lining, molding coarse and brass molding	2.00@2.75
Molding fine	2.25@2.75
Roofing sand	2.00@3.00
Sand blast	1.50@2.00
Glass sand	2.25@2.50
Massillon, O.—Traction, molding fine and coarse, core, and furnace lining	2.50
Glass sand	3.00
Michigan City, Ind.—Core, glass, traction and brass molding	.30@ .40
Mineral Ridge, Ohio—Core, furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction (green)	2.00
Montoursville Pa.—Core	1.25@1.50
Traction	1.00
Brass molding	1.40@1.50
New Lexington, O.—Molding fine	2.00
Molding coarse	1.75
Sand blast	3.00
Glass, core and traction	2.75
Furnace lining	2.50
Brass molding	2.25
Oregon, Ill.—Core and glass sand	2.00
Furnace lining	2.00
Molding fine and coarse	1.00

Miscellaneous Sands

(Continued)

Sand blast	3.50
Ottawa, Ill.—Furnace lining, steel molding, core	1.50
Roofing sand	1.50@4.50
Sand blast	4.50
Ottawa, Minn.—Core	1.00@1.50
Glass, molding coarse, stone sawing (all crude silica)	1.00@1.50
Ridgeway, Pa.—Glass sand, green	2.25
Glass sand, wash	2.50
Molding, fine and coarse	1.20
Rockwood, Mich.—Core, damp	2.50
Roofing	3.00
Sand blast	3.50@3.75
Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60
(All per 2000 lbs.)	
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.60
Furnace lining and molding coarse	3.60@4.25
Coarse core sand	3.60@4.25
Sand blast	2.30@3.60
Stone sawing and traction	2.30
Thayer, Pa.—Traction	1.50
Furnace lining	1.25
Molding fine and coarse	1.25
Core—green	1.65
Utica, Ill.—Core, furnace lining, stone sawing	1.25
Molding fine	1.00
Molding coarse	1.20
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.25
Traction, brass molding (dry)	2.25
Williamstown Junction, N. J.—Glass sand	2.80@2.90
Core, wet	2.50@2.60
Zanesville, Ohio—Molding fine and coarse, brass molding	1.50@2.00

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude talc	4.00
Cubes	45.00
Blanks, per lb.	.08
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt.—Ground talc (150-200 mesh)	8.50@10.50
(In Kraft paper bags. $1.00 per ton less in burlap bags, plus 15c for each bag.)	
Emeryville, N. Y.—150-200 mesh; bags	14.00
Glendale, Calif.—Ground talc (150-200-mesh	16.00@30.00
(Bags extra)	
Ground Talc (50-300 mesh)	13.50@15.50
Gouverneur, N. Y.—Ground talc (150-200 mesh)	13.50@14.50
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@ 3.50
Ground talc (20-50 mesh), bags, 5.75@8.25; (200-300 mesh) bags	9.25@13.75
Johnson, Vt.—Ground talc (20-50 mesh), bulk	8.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif.—Crude talc, f. o. b. mine	10.00
Ground talc (150-200 mesh)	20.00
Silver talc dust (600-mesh)	50.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	8.00@10.00
Ground talc (150-200 mesh); bags	9.00@16.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50
(Bags $1.00 extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68%@72%	5.00@6.50
Mt. Pleasant, Tenn—Analysis, .70 B.P.L. (2000 lbs.)	7.50
Montpelier, Idaho—70% B.P.L.—Crude	5.00
Crushed 2-in. ring and dried	6.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x7 to 12x6	9.60	8.40	8.10	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50

(Continued from preceding page)

Ground Rock

Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.00
Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. Ton	
Centerville, Tenn.—B.P.L. 60% to 65%	4.50@5.50
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Mt Pleasant, Tenn—B.P.L. 68%—13% Phosphorus	7.50@9.00
14% Phosphorus	8.00
B.P.L. 65@70%	7.00@9.00
Norwills, Fla.—(Fla. Hard Rock)—B.P.L. 68%	10.00

Florida Soft Phosphate

Raw Land Pebble

	Per Ton
Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

	Per Ton
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	6.00@ 7.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Bound Brook, N. J.—Trap rock, carload lots; bulk		2.30
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	11.00@17.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	30.00@32.50	20.00@25.00
Milwaukee, Wis.	21.00@30.00	21.00@27.50
Missouri river points — Different colors	20.00@25.00	20.00@25.00
Piqua, O.—Marble	8.00@10.00	7.00@ 9.00
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.—White marble	7.00@12.00	12.00
Crushed white stone and marble dust in 100 lb. bags	6.50@12.00	.....
Tate, Ga.—White limestone, sacks extra	5.00@ 7.00	5.00@ 7.00
Wausau, Wis.	14.00@18.00	.....
Wisconsin and S. Dak. points—Granite, different colors, bulk or sacks	1.50@ 2.00	3.00@ 7.00
Granite dust in bags	6.00	.....

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	18.00	26.00@34.00
Bellow Falls, Vt.	18.00	25.00
Birmingham, Ala.	16.00	27.50@50.00
Carpenterville, N. J.	15.50	40.00@65.00
Bridgeport, Conn.	31.00	32.00
Rochester, N. Y.	21.00	.....
Friesland, Wis.	25.00	.....
Houston, Tex.	.....	21.00
Lockport, N. Y.	17.00	.....
Milwaukee, Wis.	12.50	26.00@40.00
Omaha, Nebr.	16.00@20.00	30.00@40.00
Piqua, O.	15.00	25.00@50.00
Phoenix, Ariz.	16.00	35.00@80.00
Portland, Ore.	25.00	45.00@75.00
Puyallup, Wash.	22.00	35.00@75.00
Rapid City, S. D.	20.00	30.00@60.00
St. Paul, Minn.	15.00	30.00&35.00
Salt Lake City, Utah	20.00	40.00
Salem, Ore.	30.00	50.00@100.00
Seattle, Wash. (select)	20.00	50.00@60.00
Springfield, Ill.	18.00	20.00@25.00
Walkersville, Ont.	30.00	36.00
Wauwatosa, Wis.	14.00@15.00	30.00
Winnipeg, Man., Can.	19.00	40.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	9.00
Boston, Mass.	12.00@13.00
Brighton, N. Y.	14.25
Buffalo, N. Y.	16.50
El Paso, Texas (Face 13.00)	14.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	13.00
Michigan City, Ind.	10.00
Milwaukee, Wis. (delivered at job)	13.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.—Common	15.00
Face	25.00
Redfield, Mass.	15.00
San Antonio Texas—Common	14.00
Face	27.50
South Dayton, Ohio	14.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	13.00@14.00
Washington, D. C.	13.50
Winnipeg, Can.	14.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton: Finishing	Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	.....
Dallas, Tex.	25.00	.....
Denver, Colo.	30.00	.....
Detroit, Mich.	15.75	13.75
Fort Dodge, Ia.	19.70	17.00
Genoa, Ohio	10.50	.....
Grand Rapids, Mich.	15.65	.....
Gypsum, Ohio	13.90	.....
Los Angeles, Calif.	.....	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.99	.....
Plasterco, Va.	19.80	.....
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	24.00	.....

	Lump per 180-lb. Barrel (net): Finishing	Common
Atlanta, Ga.	2.00	1.60
Baltimore, Md.	.....	12.00
Boston, Mass.	3.40	3.10
Cincinnati, Ohio	.....	12.25
Chicago, Ill.	.....	1.65
Dallas, Tex.	.....	2.75
Denver, Colo.	2.95	.....
Detroit, Mich.	2.00	1.80
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	.....	1.50
Montreal, Que.	15.00†	.....
New Orleans, La.	.....	1.75
New York, N. Y.	.....	3.69*
St. Louis, Mo.	.....	1.65
San Francisco, Calif.	.....	2.25
Seattle, Wash.	3.50	2.75

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.86
Cedar Rapids, Ia.	2.28
Cincinnati, Ohio	2.37
Cleveland, Ohio	2.28
Chicago, Ill.	1.97
Dallas, Tex., incl. sacks 10c ea., 2.80; net	2.10
Davenport, Ia.	2.22
Denver, Colo.	2.90
Detroit, Mich.	2.31
Duluth, Minn.	1.95
Indianapolis, Ind.	2.23
Kansas City, Mo. (includes sacks)	2.85
Los Angeles, Calif.	3.31
Milwaukee, Wis.	2.19
Minneapolis, Minn.	2.26
New Orleans, La.	3.20
New York, N. Y. (includes bags) (10c per bbl. discount in 10 days)	2.35
Pittsburgh, Pa.	2.02
St. Louis, Mo. (incl. sacks)	2.20
San Francisco, Calif. (Pkge. 15c on and off.)	3.09
St. Paul, Minn.	2.26
Toledo, Ohio	2.31
Seattle, Wash., f. o. b. factory	2.75
F. o. b. Seattle (including sacks)	3.50

NOTE—Add 40c per bbl. for bags.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ¼x32x36" Weight 1500 lbs. Per M Sq. Ft.	⅜x32x36" Weight 1850 lbs. Per M Sq. Ft.	Wallboard, ⅜x32 or 48", Lengths 6'-10', 1850 lbs. Per M Sq. Ft.
Alabaster, Mich.	3.50	4.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blue Rapids, Kan.	3.50	4.50	7.50	9.00	11.00	11.50	11.00	.....	23.75	20.00	19.375	20.00	36.75
Centerville, Iowa	3.50	4.50	7.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Douglas, Ariz.	.....	4.00||	.....	.....	.....	10.50@12.00a	.....	.....	.....	10.50@11.50a	.....	.....	.....
†Eldorado, Okla.	.....	.....	.....	.....	11.00	11.50	.....	.....	15.50	.....	27.20	29.30	39.55
Fort Dodge, Ia.	3.50	4.50	7.50	9.00@11.00	11.00	11.50	16.45@22.00	.....	25.80	21.00	19.375	20.00	30.00
Garbutt, N. Y.	.....	.....	7.50	9.00	11.00	11.00	.....	7.50	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.50	4.50	7.50@8.50	9.00@12.00	11.00	11.00	19.50	.....	.....	21.00	19.375@25.00	20.00@26.25	30.00
Gypsum, Ohio	3.50	4.50	7.50	9.00	11.00	11.00	20.25	8.00	27.95	20.00	19.375	20.00	30.00
Loveland, Colo	3.50	4.50	7.50	9.00	11.00	11.50	.....	.....	29.80	.....	.....	.....	40.00
Oakfield, N. Y.	3.50	4.50	7.50	9.00	11.00	11.00	21.20	7.50+	28.25	22.00	19.375	20.00	30.00
Piedmont, S. D.	.....	.....	7.50	9.00	11.00	11.50	.....	.....	32.25	.....	27.97	31.04	41.18
Plasterco, Va.	4.50	.....	7.00	9.00	11.00	11.00	21.90	.....	29.90	20.00	21.375	22.00	.....
†Southard, Okla.	3.50	4.50	7.50	9.00	11.00	11.50	11.00	.....	15.50	.....	26.20	28.70	39.40

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.

*Shipment in bulk 25c per ton less; †Acme, Tex., freight rates govern; ‡Bond Plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

News

Missouri Sand and Gravel Producers' Convention

THE next annual convention of the Missouri Valley Association of Sand and Gravel Producers will be held in Kansas City, Mo., on Dec. 6, 7, and 8. Mark these dates on your calendar.

President's Conference on Unemployment

SENATOR KENYON on November 23 introduced a bill in the Senate providing for the long-range planning of public works. It was referred to the Committee on Labor.

The bill provides that authority be given the heads of executive departments to revise the plans for all public works; to make surveys and prepare engineering plans for proposed works; that the Secretary of Commerce shall publish monthly reports on business conditions so that the President, heads of departments, Congress, governors, mayors and private enterprises may intelligently plan and prepare.

The Secretary of Commerce is also instructed to transmit with recommendations all statistics by departments or private enterprises and obtain such additional facts as are necessary to carry out the intent of the bill. All work or projects may be retarded to prevent a further rise in industrial expansion and to counteract an impending period of depression and unemployment.

Portland Cement Drops 15 Cents

A LONG-DISTANCE telephone message from New York received at headquarters of the Associated General Contractors on November 25 informed General Marshall that efforts, in which he has had a part extending over the past few months, had again effected a further reduction in the price of cement, and that the Atlas Portland Cement Co. would immediately announce a reduction of 15 cents a barrel. Previous cuts amounting to 12½ per cent were announced recently.

Proposed Freight Rate Reductions

AN IMMEDIATE reduction of 10 per cent in carload freight rates on farm products covering the entire country except New England is to be made by the railroads.

The National Industrial League, the mouthpiece of the shippers of the country, is making a strong protest against the discrimination which the Interstate Commerce Commission is approving by this reduction on a part of the traffic only, says the weekly bulletin of the Illinois Concrete Aggregates Association. It is felt that whatever reduction the railroads are inclined to make should be general, as was done when the advances were made. The general impression prevails that the railroad executives are playing a political game in which there is great danger, and a strong argument for government ownership.

Before Ex Parte 74 the railroads plainly stated that their aim was to maintain rate relationships of long standing, but these promises have not been fulfilled. Their action in preferring certain commodities to the exclusion of others is the first move in bringing down their houses on their heads.

The commission has been frequently commended because of its freedom from political interference, but if the rate structure of the future is to be influenced by political pressure, the Interstate Commerce Commission may as well be abolished and play the game of the longest pole getting the persimmon.

Kentucky Mineral Survey Asked

KENTUCKY'S three leading minerals, coal, oil and fluorspar, during the three-year period from 1918 to 1920, have a total value of $401,251,701, according to Dr. Willard Rouse Jillson, director of the Kentucky Geological Survey.

Doctor Jillson states that if the state could produce more than $400,000,000 worth of these minerals with less than half of the states mapped geologically, it should greatly increase this production if maps were made for the remainder showing their mineral wealth. Of the three minerals, the fluorspar output was worth $4,199,298.

Freight Rates on Cement to New England

CARLOAD RATES on cement from Hudson, N. Y., to points in New England are not unreasonable and do not subject Hudson to undue prejudice and disadvantage and give to the Lehigh district of Pennsylvania an undue preference and advantage, the Interstate Commerce Commission has held, in dismissing the complaint in No. 11110, Atlas Portland Cement Co. vs. Central Vermont Railway Co., Director-General, et al., opinion No. 7142, 63 I. C. C., 420-30. The report covers No. 11110, covering destinations on the Central Vermont, and sub-numbers 1 to 8, covering destinations on the Boston & Albany, Bangor & Aroostook, Maine Central, Rutland, New York, New Haven & Hartford, Boston & Maine, New York Central, and Central New England, respectively. The Commission said the case "unfolds to a major extent as a contest between the Hudson and the Lehigh districts for the cement trade of New England."

"New England consumes annually about 6,000,000 barrels of cement," the Commission said. "Of this, 95 per cent comes from the combined Hudson and Lehigh districts. The greater part of the New England cement originates in the Lehigh district. This is due, according to complainant, to the failure of the carriers, which participate as delivering lines in the transportation of cement from both Hudson and Lehigh, sufficiently to recognize, by the present differentials in favor of Hudson, the geographical advantage of Hudson's location much nearer than the Lehigh district to New England."

The question to what extent, if any, there has been a failure of adequate recognition of Hudson's geographical location, the Commission said, is complicated by two outstanding contentions of the complainant with respect to relative distances from Hudson and Lehigh. One of these is that there is no Hudson rate group, as that term is commonly used, the Commission said, and that, as the complaint involves rates only from Hudson, the mileage from Hudson alone should prevail. The other contention, the Commission said, relates to relative conditions of transportation as affecting a proper comparison of mileages from Hudson and Lehigh. The Commission said that, to New England as a whole, the rates from Hudson and Lehigh, so far as mileage controls, were not shown upon the record to be improperly related. The Commission said to apply a distance scale from all points in the Hudson and Lehigh districts would disrupt long existing relationships, upon which the industry has grown up, including relationships which were not in issue in the proceeding, had not been shown to be necessary or advisable at this time.—*Traffic World.*

Atlanta Freight Rate Hearing Concluded

FRIDAY, November 18, marked the termination of the freight rate hearing before the Georgia Railroad Commission. It was a very satisfying hearing to the

Southern sand and gravel producers, who are putting up a big fight against the Southern Railway's proposed mileage scale. On completion of the evidence submitted by President Johnston and Traffic Manager Brooker of the National Association of Sand and Gravel Producers, the chairman of the commission complimented both of these gentlemen on their able presentation of the claims made by the producers.

The compilation of true abstracts of records obtained from producers, highway and industrial contractors operating in Georgia not only made a significant impression on the members of the commission, but revealed to the representatives of the transportation companies that they were not aware of facts that should have been common knowledge. Mr. Brooker presented some of these facts, a few of which are herewith given. On a mile of 18-ft. roadway the sand and slag cost $1529. The freight charges amounted to $2612.50, an increase of 70.9 per cent over the 1918 rate. The proposed rate under consideration at this hearing would mean a freight charge on this same material of $3992, or an increase over the 1918 rate of 161.1 per cent and an increase over the present rate of 52.8 per cent.

Figures were secured on tonnage and cost of transportation in the erection of the Atlanta Warehouse Co.'s warehouse —locally known as the Candler Warehouse—as follows: Tons, 120,786; freight paid, $56,075.80. If this building was duplicated today the freight charges would amount to $103,776.71, an increase of 85.1 per cent. If constructed with the proposed rate of freight charges this would amount to $156,861.10, or an increase over its actual freight cost in 1916 of 179.7 per cent.

An addition is under way to the Federal Reserve Bank, for which these figures were submitted: The 7320 tons of sand and gravel being used cost $3658.80; the freight charges aggregate $7879, being an increase over the 1918 rate of 69.1 per cent. If the proposed rate asked for by the transportation people is made effective, the freight on this same material would amount to $11,313, or an increase over the 1918 rate of 139.8 per cent.

These are fair instances used in arguments against the representations made by the Southern Railway that the rates asked would mean a reduction in freight.

Texas Chamber of Commerce Wants Rates Investigated

THE Chamber of Commerce of Colorado, Mitchell county, Texas, has asked for an investigation of the present freight rates of the Texas & Pacific railroad on sand and gravel from Colorado to Abilene. Local contractors have complained of losing large orders on account of points on the Abilene & Southern railroad having an advantage of 10 cents a hundred on the freight rate into Abilene. Colorado's sand and gravel deposits are among the best in Texas and the demand for these materials is rapidly increasing.

Railroads Refused Right to Raise Freight Rates

IN COMPLIANCE with the order of the Interstate Commerce Commission issued on November 4, the Public Service Commission of Missouri has notified the committee representing the Missouri railroads that it would refuse to increase their freight rates on stone, brick, gravel, limestone, cement, etc. This refusal is construed as meaning that no permits for higher rates upon the commodities listed will be filed until the right or lack of right of the Interstate Commerce Commission to regulate freight rates is determined by the Supreme Court of the United States.

More Cuts in Limestone Rates

TWO more railroads, the Missouri and Illinois and the Southern, have adopted the reduced limestone rate schedule urged by the Illinois Agricultural Association, making a total of 14 in the state now offering the lowered rates. More than 60 per cent of the total railroad mileage of Illinois, or 7,334.75 miles, is affected by the reduced agricultural limestone rates which will save farmers from 10 to 30 per cent of what they had been paying.

New Jersey's New Roads to Cost $1,885,741

ROAD building contracts to the amount of $1,885,741 will be awarded by the New Jersey State Highway Commission as a result of President Harding's conference on unemployment giving $942,870 in Federal aid to that state. New Jersey will match the appropriation coming from the national government, the amount to come from the $75,000,000 available for road work. Governor Edwards has wired the government that New Jersey will immediately prepare to contract for new roads.

Annual Meeting of American Road Builders' Association

THE annual meeting and dinner of the American Road Builders' Association was held in New York City on November 15. Plans were discussed to increase the usefulness of the association. Col. J. W. Howard, a New York consulting engineer, gave a talk on early paving work in that city, and Samuel Hill, president of the Washington Good Roads Association, discussed highway development.

The following officers for the ensuing year were elected: President, H. L. Bowlby, chief of the War Materials Division, Bureau of Public Roads; vice-presidents, Charles J. Bennett, highway commissioner of Connecticut, New Haven; Frank Page, chairman, North Carolina Highway Commission, Raleigh; A. R. Hirst, state highway engineer of Wisconsin, Madison; W. W. Crosby, National Park Service, Estes Park, Colo.; secretary, E. L. Powers, editor, *Good Roads*, New York; treasurer, Senator James H. MacDonald, former state highway commissioner of Connecticut, New Haven.

Asphalt Claims 3690 Miles of Streets This Year

THAT American cities are making tremendous strides in street paving, declares the Asphalt Association, is indicated in city engineers' reports, which show that over 30,000,000 sq. yds.—1750 miles—of 30-ft. asphaltic pavement will be laid on the state highways. The area in counties and other districts will bring the total to 65,000,000 sq. yds., or 3690 miles. This is a yardage increase of 35 per cent over 1920.

Saginaw, Mich., breaks the record with an increase of 600 per cent. Akron, 500 per cent; Rochester, 350; Chicago, 60; Des Moines, 100; Boston, 50; Columbus, 40; Norfolk, 100; Detroit, 50; Portland, Ore., 20; Roanoke, 60; San Antonio, 6.

Asphalt paving laid in leading cities includes New York, 1,991,783 sq. yds.; Boston, 456,921; Washington, 244,623; San Antonio, 212,400; Indianapolis, 401,000; Rochester 323,547; Detroit, 1,295,000; Baltimore, 943,566; Portland, Ore., 312,336; Providence, 271,892; Chicago, 1,613,600; Birmingham, 270,000.

Materials Associations to Participate in Good Roads Congress

DURING the American Good Roads Congress and National Good Roads Show to be held at the Coliseum, Chicago, January 17 to 20, three of the sessions will be given over to the Portland Cement Association, the Asphalt Association and the National Association of Paving Brick Manufacturers. Discussions will be had as to the proper methods of building types of concrete roads, asphalt and other bituminous types of streets and roads and the latest methods for constructing gravel, macadam and earth roads.

Joplin Meeting of Sand and Gravel Producers

THERE will be a meeting of chatt and sand and gravel producers at Joplin, Mo., on December 9, at which President Johnston, Executive Secretary Sutton and Traffic Representative Brooker of the National Association will be present. S.

A. Fones of the Independent Gravel Co., Webb City, is arranging the details of this meeting.

Cement Business Improving in Memphis

REPORTS from Memphis declare that business in cement for October showed the best results in 12 months—in fact, nearly up to the war peak. Cement prices, considering high freight rates, are down to pre-war levels. There has been a great deal of small building, say the reports, and the outlook is good for more business of this kind.

U. S. Gypsum Declares 5 Per Cent Dividend

A FIVE PER CENT stock dividend on the common stock of the United States Gypsum Co. was declared on November 9, together with disbursement of the regular quarterly dividends of 1 per cent on the common and 1¾ per cent on the preferred stock. All the dividends are payable December 21 to stock of record December 15.

The stock dividend will be worth about $197,000. Early this year there was a 5 per cent stock dividend and the company has maintained dividends at the rate of 4 per cent a year.

San Diego as Gypsum Center

A MOVEMENT is on foot to make San Diego, Cal., a Pacific Coast center for marketing gypsum. Aman Moore, representing the California Gypsum Corporation, says that California has in its five gypsum deposits sufficient gypsum to keep a factory going for centuries. With her natural harbor, San Diego can be made one of the great cities of the coast, stated Mr. Moore, if the gypsum industry is properly developed. A little over 100 miles away there is 1,000,000,000 tons of practically pure gypsum. Manufactured into such commercial products as plaster of paris, wall plaster, keene cement, land plaster, wall board, hollow building blocks, it can be shipped to almost all countries of the world.

Mr. Moore says that the California Gypsum Corporation owns four of the five gypsum deposits and that a steam shovel can easily dig it up and load it on cars at a cost of only a few cents a ton. He asks that the local chamber of commerce investigate his claims and assist in developing what will one day become a giant industry.

New England's Lime Production

NEW ENGLAND'S lime production for 1920 was 326,177 tons, with a total value of $4,719,338—about 9 per cent of the total annual production of the United States. New England limestones rank with the highest grades produced. There are extensive deposits in Connecticut, Massachusetts, Rhode Island, Vermont and Maine. In 1920 there were manufactured 176,578 tons by 30 plants for use in New England in construction and materials and for shipment to other states.

The Eastern Bureau of the National Lime Association has recently launched an extensive study of the lime requirements of New England soil, with a branch headquarters at Springfield. Prof. R. C. Parker, formerly of the Cornell University extension service, is the technician in charge. The bureau has about 200 fertility and crop experiments under operation.

Charts on Soil Liming

AS A PHASE of its educational work, the National Lime Association is issuing sets of charts dealing with the various phases of soil liming. The first installment is ready for distribution without charge to agricultural workers.

The five charts deal with the need of United States soils for lime, monetary returns from liming, comparative strength, purchase of soil limes, and lime, hay and livestock. Later charts will extend these subjects. Each chart is accompanied by a brief explanation that may serve as the basis of part of a lecture. The charts are on paper 3x2 ft. in size. When complete, a set will consist of about 12 charts.

Anyone desiring these five charts should write to the Agricultural Department of the National Lime Association, 918 G Street, N. W., Washington, D. C., giving his official position and address. This will entitle him to receive the remainder of the series.

Six Brooklyn Schools to Be Built of Crozite

SIX of the new schoolhouses to be erected in the Borough of Brooklyn, N. Y., will be built of Crozite "wet" process brick, the product of the Brooklyn Crozite Brick Corporation. This company reports that it is delivering Crozite brick for many of the housing operations in the borough as well as for public buildings.

The company's plant at East New York occupies, together with its sand and gravel properties, an area of over 20 acres. The plant is very well equipped, none of the raw materials, the pallets or the finished brick being handled manually from the delivery of the raw materials to the shipping of the finished product.

Crozite brick, it is estimated, will be a major factor in supplying the demand for building material in the program for business now being pushed to relieve the housing congestion in this borough.

Improvements Planned for Plymouth Gypsum Co. Mills

PLANS have been made for extensive improvements at the mills of the Plymouth Gypsum Co., Fort Dodge, Ia., this winter. The Plymouth mills will be provided with facilities for the storage of 40,000 tons of gypsum rock, to be handled by movable cranes of the railroad type.

The plaster and wall board plant will have increased drying equipment which will bring the capacity of the mill up to 100,000 ft. per day, requiring about 80,000 tons of plaster.

A large expenditure will also be made on the gypsum plaster plant, in which two large block machines will be installed. These machines are new devices for producing gypsum blocks and will revolutionize the manufacture of gypsum blocks in that the cost of production is very low and only three men are needed to operate one machine. Each machine will turn out 1500 ft. of block per hour. It will require 150 tons of plaster per day to keep these machines in operation.

The retarder plant is being improved and enlarged and the mortar plant will get additional machinery.

The Iowana Gypsum Products Co.'s plant will be completed this winter. Two additional kettles, now on their foundations, are to be bricked in and other equipment added to make the Iowana mill of four-kettle capacity. The two mills will ultimately provide eight kettles for this company.

A rush of business is expected by the Plymouth companies in 1922 as they predict a rush for houses and large structures in the spring.

Magnesia and the Fertilizing of Vines

In a summary on the uses of magnesium (Mg) as a fertilizer, J. Leferve, a French agromonist, points out that the use of Mg in the form of a dolomite is particularly valuable for vine culture. Special attention is called to the combination of Mg and Ca oxides which is manufactured by several factories in France and sold under the name of dolomagnesium. When the Mg is administered in this form, either alone or in combination with other fertilizers, it has none of the toxic effects of Mg sulphate and chloride. In addition to its value as a direct nutrient and in amending acid soils it has also an antichloritic action. A number of experiments conducted under varying conditions indicate that a normal dose of dolomagnesium is from 500 to 1,000 kg. per hectare; 2,000 kg. per hectare (1,780 lbs. per acre) can be used without injury in making an initial application. Dolomagnesium can be mixed with other fertilizers except nitrogenous fertilizers.—*Chemical Abstracts.*

News of All the Industry

Incorporations

The Bedford Steam Stone Works Co., Bedford, Ind., has been incorporated at $30,000.

The St. Francis Crushed Granite Co., Farmington, Mo., has been incorporated at $20,000.

The Gypsos Plaster and Supply Co., Indianapolis, Ind., has filed a certificate of final dissolution.

Rib-Stone Concrete Corporation, Batavia, N. Y., has increased its capital from $300,000 to $1,000,000.

The Painter Lime and Cement Co., Huntington, N. Y., has increased its capital stock from $238,800 to $650,000.

The Peerless Lime and Coal Co., Canton, Ohio, has been incorporated at $30,000 by B. F. James and August Heimann.

The Clarendon Monument Works, Clarendon, Texas, have been incorporated by T. O. Collier, J. B. and J. C. McCarley.

The Builders' Supply Co., Augusta, Ga., has been incorporated at $10,000 by J. A. Laroque, James B. Muljerin and A. B. Moore.

The Imperial Stone Co., Bedford, Ind., has been incorporated at $150,000 by A. E. Dickenson, J. R. Rowe and W. R. Martin.

The Builders' Supply Co., Mexia, Texas, has been incorporated at $20,000 by R. B. Albaugh, A. B. Stringer and Mrs. R. B. Albaugh.

The Mikelson Cement Products Co., Albert Lea, Minn., has been incorporated at $50,000 by John Mikelson and Niels Nielson.

The Anderson Brick and Supply Co., Manhattan, N. Y., has been incorporated at $5000 by J. C. Anderson, S. P. Fields and A. T. Helfer.

Simplex Concrete Block Co., Worcester, Mass., has been incorporated at $50,000 by Gustaf B. Tobiesen, John H. Johnson and C. L. William Bloom.

The Nelson Concrete Culvert Co., Lake Charles, La., has been incorporated at $75,000. A. LaGrange is president, P. W. Kiplinger is secretary and W. H. Butler is manager.

The Pro-Slate Building Co. of Wisconsin, Milwaukee, Wis., has been incorporated to deal in building materials of all kinds by William H. Bennett, Walter F. Mayer and C. J. Quinn.

The Potter Lumber Co., Potter, Wis., has been incorporated at $25,000, 250 shares par $100, to deal in lumber, fuel, brick, tile lathe, roofing, drain pipe, stone, and other building materials. The incorporators are: Elmer E. Meyer, H. L. Meyer and John J. Madler, Hilbert, Wis.; Henry Leppla, Brillion, Wis.; Rudolph Greve, Kiel, Wis.

Quarries

Cripple Creek, Colo.—The rock-crushing plant has undergone alterations and new machinery is being added.

J. J. Slate, Jefferson City, Mo., has purchased land and will open a limestone quarry and erect kilns, etc.

Dundas, Ont.—Fire destroyed the plant of the Western Canada Stone Cutting Co., the loss being estimated at $50,000.

Jolly Brothers have purchased a site in Florence, Ala., and will erect a building and install marble-working machinery.

The Dixie Construction Co., Birmingham, Ala., will use a 70-C Bucyrus shovel to handle the rock at their quarry near Verbena, Ala.

The Kelley Island Lime & Transport Co., Marblehead, Ohio, J. A. Kling, president, is about to begin the erection of a $10,000 crushing plant.

Marquette, Mich., proposes to issue bonds for $35,000 for the opening of a quarry and establishing a rock-crushing plant. J. H. O'Meara is city clerk.

Granville, N. Y.—The Owens Brothers have opened a new quarry on the Hammond farm, with machinery and electrical equipment. The vein is said to be several miles long. Other quarries are in contemplation.

Victoria, B. C.—A large consignment of British Columbia granite has been shipped to Australia recently, following a consignment of specimen stone sent some months ago. The quarries expect to make other shipments before long.

Cushing, Okla.—Specimens of limestone taken from a quarry near Cushing have been sent to the Oklahoma A. and M. college for analysis to ascertain their fertilizing properties. This is the second quarry in this vicinity from which specimens have been taken recently for this purpose.

The Templeton Limestone Co., Kittanning, Pa., will build a crushing plant, 30x60 ft., and powerhouse, 25x35 ft., at its property at Templeton, near Kittanning, to replace its works recently destroyed by fire. W. L. Snyder is superintendent.

Jefferson City, Ala.—The old Gordon limestone quarry was sold November 5 by J. Frank Morris to J. J. Slate, local contractor. The purchase was made in anticipation of the road work that is about to be launched soon by the state. Mr. Slate expects to erect a number of kilns in the quarry and burn limestone and cement there.

The George Doyle Stone Co. has produced the largest one-piece stone columns ever made in the Bedford, Ind., district at its Dark Hollow quarry and mill. A special derrick has been built to swing the blocks, which are 33.8 ft. long by 4.10 ft. square, to a lathe built especially for turning these columns. Thirty-six columns will be shipped to Harrisburg, Pa., to be used in the new Pennsylvania state house.

Sand and Gravel

The Petersburg Sand and Gravel Co., Petersburg, Va., has sustained a fire loss of about $8000.

The Lincoln Sand and Gravel Co., Lincoln, Ill., reports that it had its greatest business of the year in October.

The Hepworth Silica Pressed Brick Co., Hepworth, Ont., is investigating the sand deposits at Elliott's Point, Ont., with a view to establishing a second sand-lime plant there.

The Escambia Sand and Gravel Corporation, of which C. D. S. Clarkson is president and manager, Flomaton, Ala., has purchased an 8-in. pumping dredge and other equipment.

The Bible Sand Co., Chattanooga, Tenn., has applied for an amendment changing its present name to Dixie Sand and Gravel Co. There is no change in ownership or location of offices.

The Rock Products Co., Perth, Ont., created under the laws of the state of Ohio, has been licensed to operate in Ontario to deal in rock, sand and gravel and manufacture and sell feldspar and building products.

Webb City, Mo.—A spur track used for carrying gravel for the Ada-Ment Co. was carried down in a cave-in on November 17. The cave-in was 30 ft. across and 70 ft. deep when discovered, but several acres may be included.

Kavanagh & Van Keuren, Sussex, N. J., announce that they are now crushing seven grades of stone. They will also make sand at their plant and ship by truck. The plant uses a 100-hp. engine and is operated continuously.

The Baker Gravel Co., Noblesville, Ind., is receiving shipments of material for a new suction system in their gravel pit, spending $20,000 on the new system. The company expects to handle 1000 yds. of material daily by the change.

Bloomfield, Mo.—Gravel pits north of this town are to be reopened. A new 60-ton engine for handling the cars has been purchased and there is work sufficient to keep 30 men employed throughout the winter.

Memphis, Tenn.—Preparations are being made for establishing one of the largest sand and gravel plants in this section. A fine deposit has been found along the banks of Wolf river at the foot of Breedlove avenue. A 75-acre area has been acquired by J. A. Pollard, on which he intends to erect a $75,000 plant. He has invented a machine for digging at economical cost. An artificial lake will be made. Fred Callahan, Clarence DeVy and V. G. Schoelch will be associated with Mr. Pollard in the new company.

Cement

Tidewater Portland Cement Co., Union Bridge, Md., recently fired a blast in which there were 22 holes 110 ft. deep containing 6500 lbs. of dynamite.

The Oklahoma Portland Cement Co. at Ada, Okla., has exceeded its October shipment, sending out 130,000 bbls. this month. The old plant is now in operation also, making a greater monthly output possible.

Huron Portland Cement Co., Alpena, Mich., has asked the city for permission to change Mill street in the vicinity of the company's plant to allow the construction of an addition to the plant. Construction work is ready to begin.

Springfield, Mo.—Students of the chemistry classes of Professor Neal at Drury College inspected the Ash Grove Lime and Portland Cement Co.'s plant at Galloway, where Superintendent Barton explained the process of lime manufacture to the students.

Alpha Portland Cement Co., with a plant near Catskill, N. Y., has resumed operations in all branches. This plant shut down in October. The company has a large booking of orders and it is expected that every department will be operated through the winter.

Three Forks Portland Cement Co., Denver, Colo., recently announced that manufacture will be resumed at both the Trident and Hanover plants. Large stocks on hand when the plants closed last March have been nearly consumed and construction anticipated next summer is expected to require the full output of the two factories.

The Acme Cement Corporation, Alsen, N. Y., has just completed its new pier which will enable the company to ship 3000 bbls. a day. The pier head is reached by a 3300-ft. stone causeway connected with the works by a standard-gage railroad, over which cement will be delivered to the vessels.

Gold Hill, Ore.—The local cement plant, which has operated steadily for the last two years, has closed down for general repairs. Orders have slacked down, permitting the filling of the storage warehouse sufficiently to supply orders for several months before resuming. This will require extensive equipment to be added to handle the rock.

The Emry Lumber & Fuel Co., Hood River, Ore., has taken over the Bradley Cement Works and the concern will be operated in conjunction with the purchasing company's business. The cement company recently completed a factory. During the winter the new factory will be equipped with machinery, and plans to develop one of the finest types of cement manufacturing plants in this state.

Bartlesville, Okla.—The Dewey Portland Cement Co. has let a contract with the McDonald Engineering Co., Chicago, for the erection of four cement storage tanks, each with a capacity of 20,000 bbls. The contract was for $60,000. President Tyler has announced that, with the exception of four specialists brought from Chicago, all the labor will be performed by local labor, which will enable the cement company to keep a large force of men employed until about February 1. The company now has four large storage tanks and the new tanks will practically double their capacity and enable a larger scope of operation for the plant.

Concrete Products

The Universaly Cement Casnet Co., Dunnville, Ont., has let a contract for the erection of a factory for the manufacture of cement caskets.

F. W. Wasserman, Joplin, Mo., plans to establish a plant in Carterville, Mo., for manufacturing marble facing on concrete.

T. A. Mickie, Steele, Mo., is about to move his concrete block manufacturing plant from that place to Blytheville, Ark.

The Concrete Products Co., Houston, Texas, reports a rapidly increasing business in foundation blocks and reinforced cement posts. The company is building a new plant, modern in every way, that will double its present capacity.

Gypsum

Kern County Gypsum Co., McKittrick, Cal., is displaying samples of gypsum fertilizer at the Bakersfield Chamber of Commerce. Gypsum deposits are located near the oil town and are controlled and operated by the company. M. T. Davis is general manager.

Brawley, Cal.—William Tatum, an Eastern banker, has become interested in the California Gypsum Co's claims, west of Brawley. In company with J. D. Fox, one of the original claimants, Mr. Tatum visited these deposits recently, expressing his astonishment at the amount of mineral in sight, its evident suality and the opportunities for development. Much Eastern capital is being invested in the claims, according to Mr. Fox, and production will begin in the near future.

Lime

The St. Mary's Cement Co., St. Mary's Ont., is finding a good market for super-cement. It is used where waterproofing is required and sells at $1 a barrel above portland cement.

Columbia, Tenn.—A reduction of 52 cents per ton on crushed limestone delivered to farmers of this section has been announced. This reduction will mean a great saving to the farmers of the county, and crushed limestone is an essential to their welfare.

The Blue Diamond Plaster Co., Los Angeles, Cal., has announced that hereafter it will be known as the Blue Diamond Materials Co., Inc. The concern is the largest manufacturer, producer and distributor of building materials in Southern California.

Rock Phosphate

C. E. Bussell, 525 Henry building, Seattle, Wash., wants to interest an investor with $10,000 in an extensive phosphate rock deposit in Montana, and its grinding into flour and distribution as fertilizer.

The Coronet Phosphate Co., Barton, Fla., operating the Coronet and Pembroke mines, has resumed operations to restock for immediate orders. The work will continue until some 200,000 tons has been mined, which will keep the 500 to 600 men employed for the next 10 months.

Manufacturers

The National Steel Construction Co. has moved its principal office from 300 Hostetter building, Pittsburgh, to Bellwood, Pa.

The Aetna Explosive Co. has been succeeded by the Hercules Powder Co. The advertising, purchasing and traffic departments will be located at the Wilmington, Del., offices, with branch sales offices at 120 Broadway, New York City.

The Orton & Steinbrenner Co., Chicago, manufacturers of locomotive cranes, clamshell and orange-peel buckets, has made arrangements with the F. C. Richmond Machinery Co., 117 West Second street, Salt Lake City, Utah, to represent it.

The American Manganese Steel Co. announces the appointment of Bradley S. Carr as manager of its pump department. Mr. Carr is well equipped to advise in matters pertaining to centrifugal pumps through his training and years of practical experience.

The Osgood Co., Marion, Ohio, announces the opening of a branch sales office at 1211 Conway building, Chicago, which will be in charge of Arthur B. onneborn, as manager. This announcement will be of particular interest to Osgood customers and contractors in and around Chicago, inasmuch as they will be able to get full information regarding Osgood steam shovels and excavating machinery direct from the Chicago office.

Arthur D. Little, Inc., chemists, engineers, managers, Cambridge, Mass., have established a valuation and appraisal department under the direction of William H. Kobbe as valuation engineer. These valuations are used for establishing rates of depletion, depreciation and the substantiation of invested capital; are required to secure bond issues, loans and as a basis for sales; to prove amortization of war facilities, and are particularly useful in cases of reorganization. Many industries demand such reports to expose the true state of their business activities or for purposes of Federal or state taxation. There is a staff of over 30 specialists. A branch office is maintained in Washington.

Personal

C. L. Trimmingham, agent for the Ontario Gypsum Co. in the province of Quebec, is now located at 14 St. John street, Montreal.

W. H. K. Bennett has severed his connection with the American Manganese Steel Co., Chicago, and has entered the engineering business on his own account, specializing in sand and gravel plants and dredges.

A. W. Schulthis, president of the Western States Portland Cement Co., was the host of the Independence, Kans., Rotary Club on November 11. The club was shown through the company's big plant and a dinner was served in the company's restaurant.

E. Schmatolla, designer and builder of fuel economizing lime kilns, has removed his New York City office to 111 Nassau street. At his laboratory in Newark, N. J., Mr. Schmatolla makes models of lime kilns and other kilns and furnaces in sections showing all interior details. Photographs of these models are free upon request, as well as practical tests of small mail samples.

John Prince, president of the Stewart Sand Co. and the Prince-Johnson Limestone Co., Kansas City, Mo., is again in the limelight, for he addressed the local Council of the Consumers' League on a new water bonds issue and charter amendments at a meeting on November 15. Mr. Prince also said that the next six years will be the best time in the next 25 years to construct a new plant from an industrial standpoint, as the cost of construction is down, material prices have dropped and there is an abundant supply of labor.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

WANTED
Drag Line Excavator
100-Foot Boom

Prefer electrically operated machine on trucks, but would consider steam.

Will Pay Cash

MONTEZUMA GRAVEL COMPANY,

Box 336 Terre Haute, Indiana

DRYERS

Having purchased 30 dryers 4'-0" dia. x 30'-0" long, with rollers, tires, gears, shafting, blowers, etc., we are prepared to offer them at a sacrifice before removal. Dryers are new and were never used. Furnace grates and doors or steam coils supplied. Write for price.

McDermott Bros. Co.
Allentown, Pa.

IMMEDIATE DELIVERY

NOS. 6, 7½, 9K & 18K CRUSHERS.
50-75 HP. single drum hoists, 25 Cy. Motors, 440 V. 3 Ph.
25-50-100 Kw. Eng. & Turbo sets, D.C. & A.C.
250-300-500 Kw. Turbo & Eng. Sets.
BELT & STEAM DRIVEN COMP., 50-5000 ft.
2-6-12 Ton 24 in. Gauge Gasoline Locos.
6-8-10 in. Sand Pumps, belt and 6" Eng. Drive.
25-40 HP. double drum Elec. Hoist, 440 V. 60 Cy. 3 Ph.
5-10-15 Ton Holt Tractors.
2-290 HP. NEW B&W 200 lb. boilers.
150 HP. 156 lb. Boiler, buttstrap, Indpls.
9K GATES REG. DRIVE, BARGAIN, $4650.00.

Send Us Your Inquiries, Centrif. Pumps, Motors, Compressors, Electrical Equipment, etc.

ROSS POWER EQUIPMENT COMPANY
Indianapolis, Ind.

We have for sale the following used machinery, in good condition, subject to prior sale, and cost of loading to be assumed by the purchaser.

1—No. 5 Champion Crusher	$ 500.00
1—No. 6 McCully, with extra head and shaft, two extra Master Wheels	3000.00
1—42" Trunion Chain Driven Revolving Screen, 18 ft. long	450.00
1—52" Trunion Chain Driven Revolving Screen, 18 ft. long	700.00
1—Thew No. 1 Steam Shovel, on Standard Railroad Gauge, having a one cubic yard dipper, Shop No. 835	3000.00
1—National, 3 Drum Hoist—10"x14" Cylinders, 30"x36" Drums	800.00
1—Bay City Clam Shell Bucket, No. 733	50.00
1—Upright Boiler Shell, 4'x11', 5-16" plate, lap seam, 2" Tubes (requires new tubes)	100.00
500 feet 2" Cable	250.00

E. J. LAVINO AND COMPANY
Attention Stone Dept.
559 Bullitt Building Philadelphia, Pa.

Rebuilt Machinery

8—Jaw Crushers—6x10 to 15x24.
1—Gates Gyratory Crusher—No. 5.
1—Gates Gyratory Crusher—No. 8.
12—Sets geared Crushing Rolls.
4—Williams Crushers and Pulverizers.
1—No. 48 American Pulverizer.
1—4½' x 13" Hardinge Pebble Mill.
1—Braun's Laboratory Pulverizer.
20—Air Compressors, Steam and Belt Driven, 17 to 3000 cu. ft. capacity.
30—Rock Drills, Steam or Air.
20—Vertical Steam Boilers—6 to 40 HP.
24—Horizontal Steam Boilers, 35 to 180 HP.
24—Steam Engines—6 to 500 HP.
30—Oil, Gas and Gasoline Engines—2 to 800 HP.
1—1200 KW. Electric Power Plant, Complete.

Also the "Clean-up" of the Altoona Cement Plant, North Altoona, Kansas—a bargain lot of crushing, pulverizing, elevating and conveying equipment, steel buildings, steel storage bins, etc.

The Machinery & Supply Corp.
JOPLIN, MISSOURI

FOR RENT AND SALE

13—6-yd. re-built dump cars, std. gauge.
20—12-yd. Westerns, like new, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, used 8 mos.
1—Marion 30 combination shovel and drag-line, No. 4725, caterpillar traction, 1½-yd. bucket; used 4 mos.; built March, 1921.
1—Marion 76 steam shovel, No. 3503, std. gauge.
1—Marion 76 steam shovel, No. 3503, std. gauge.

LOCOMOTIVES

2—32-ton Vulcan four-driver saddle-tank, used sixty days; built March, 1921.
1—40-ton 17x24 in. four-wheel switcher.
2—50-ton 18x24 in. six-wheel switchers.
2—NEW 25-ton six-wheel Porters, separate tenders, 36 in. gauge.
2—18, 14, and 10-ton Vulcans, 36 in. gauge.

Locomotive-Cranes, Railway Equipment, Etc.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Ill.

FOR SALE

10"x14" Vulcan 12-ton dinkey 36" gauge.
Marion drag line excavator, 50' boom, shop number 4058.
5 roller, high side Raymond pulverizer.
Williams swing hammer pulverizer, number D-43.
20 3-yard side dump 36" gauge, Oliver tram cars.
14 1½-yard, side dump, all steel, 36" gauge tram cars.
12 1-yard, side dump, all steel 36" gauge tram cars.
2 American process dryers, 24' long by 48" diam., sprocket driven.
125 h.p., 16" by 24" steam engine.
6 h.p. F. & M. gasoline engine.
Worthington Steam pump 10" intake, 8" discharge, 20" cylinders, shop number 16876.

E. W. COOPER
174 Third Ave., North Nashville, Tenn.

"DREDGING PUMP" FOR SALE

One 10" Morris Sand and Gravel dredging pump, 10" suction, 10" discharge, direct connected to double 9x9 engines.
One Scotch Marine Boiler, 200 H. P.

M. A. CALLAHAN
"The Sand Man"
Schofield Bldg. Cleveland, Ohio

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1¼ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—⅝ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

STEEL RAILS

We offer for immediate shipment the following choice lots of relaying steel rails:

3,000 tons 60 lb., with angles.
2,000 tons 56 lb., with angles.

Free delivery to any point on Illinois Central R. R., south of St. Louis; attractive prices also can be made to any contiguous territory or for export.

600 tons 35 lb., with angles, located at Red Lick, Miss. This rail is well situated for delivery to points in Alabama, Mississippi and Louisiana, or for export.

300 tons each 30 lb. and 35 lb., located Whelen Springs, Arkansas.

250 tons first-quality new 25 lb. billet steel rails, and fastenings, located Austin, Texas.

Terms will be made to responsible buyers. Address inquiries to

Shook & Fletcher Supply Co., Inc.
Birmingham, Ala., or
Birmingham Rail & Locomotive Co.
Birmingham, Ala.

NO. 8-D, GATES GYRATORY CRUSHER

STANDARD DRIVE

Fitted with manganese head and concaves. Included with this crusher, we have the following extra spare parts:

1 New, Manganese head.
1 New, set of manganese concaves.
1 New, main shaft.
1 New, Spider, and 2 New, eccentrics.

We also have many other sizes and types. We specialize in good quarry equipment of all classes. Write us fully.

Reading Engineering Co., Inc.
1227 Tribune Bldg., New York, N. Y.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½x25′, 4x30′, 5½x50′ 6x50′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 3½x25′, 5x60′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 2½x3″ 3x3½′ pebble and ball mills; 8x4′, 6x4′ and 4x4′ continuous ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 30x60″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 36″ and 40″ cage mills; 3′ and 4½′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 3 roll and No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens, Richardson automatic scales.

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

USED MARBLE WORKING MACHINERY FOR SALE

Patch Carborundum machine 6x10 bed; two 12-ft. rubbing beds; one 8-ft. planer; four buffing machines; three gritting machines. All with direct connected motor drive. Also a lot of carborundum and steel centre wheels. All of this machinery is in excellent operating condition and will be sold at low prices.

N. O. Nelson Marble Works - - - - Edwardsville, Illinois

New Rubber Belting

300 ft. 12″ 6-ply	$0.99 per ft.
423 ft. 14″ 5-ply	1.04 per ft.
527 ft. 14″ 6-ply	1.25 per ft.
529 ft. 16″ 6-ply	1.39 per ft.
520 ft. 16″ 8-ply	1.90 per ft.
150 ft. 18″ 6-ply	1.48 per ft.
512 ft. 18″ 8-ply	2.00 per ft.

Rolls cut to any length.

The National Belting & Salvage Co.
268 East Water Street, Milwaukee, Wis.

WANTED

2 end dump quarry cars, steel body 1½ yd. 36″.
1 No. 2 Gates Gyratory Crusher.

Give complete description in first letter, also location.

Wabash Stone Co., Geneva, Ind.

FOR SALE

CRUSHERS: 1—Number 5 Austin. 1—Number 4 Gates, Manganese fitted. 1—Number 3 Austin mounted. 1—Number 2 Gates, two arm spider.

SHOVEL: 1—Type O Traction, ⅝ yard dipper.

GREAT LAKES EQUIPMENT CO.
327 South LaSalle Street Chicago, Ill.

FOR SALE

No. 8 Austin Gyratory Crusher, Right Hand Agne Drive. Austin Elevator 67½-foot Centers 30-in. Buckets. 48-in. x 20-ft. Austin Screen. 24 x 24 Friction Hoist. 100 hp., 900 r.p.m., 3 phase, 60 cycle, 220 volt General Electric Motor. Above machinery in good condition, having crushed only about 250,000 tons limestone. Centrally located. Address

Box 1517, Care of Rock Products
542 South Dearborn St. Chicago, Ill.

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

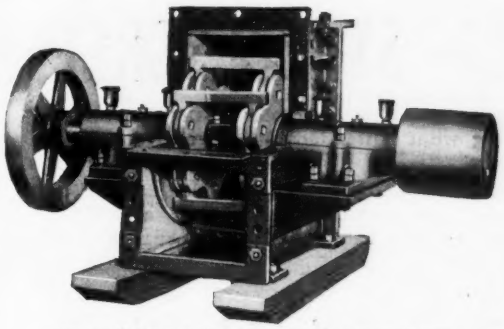
M. K. FRANK
Frick Building Pittsburgh, Pa.

FOR SALE

40″ PULLEY.

40″ face, 40″ diameter. Straight face, double arm type. Brand new; never used. Bargain.

MADISON COAL CORPORATION
910 S. Michigan Ave. Chicago, Ill.



Interior of K-B Pulverizer showing Lining Plates

Does the Material You're Handling Pulverize Your Pulverizer?

All parts of the K-B Pulverizer that come in contact with the material to be crushed are made of Manganese Steel.*

Only STEEL will stand the stress
"K-B" is built ALL-Steel
All "K-B" wearing parts are Manganese Steel

Send for Catalog with full particulars

K-B Pulverizer Company, Inc.

K-B PULVERIZER

92 Lafayette Street
New York

**The best material obtainable for the duty required.*

MORE GRAVEL; less cost

Even the smallest ERIE often gives an output of 500 tons a day, or even more under favorable conditions.

P. Cogger, Lowell, Mass., owner of the 13-ton ERIE shown above, writes:

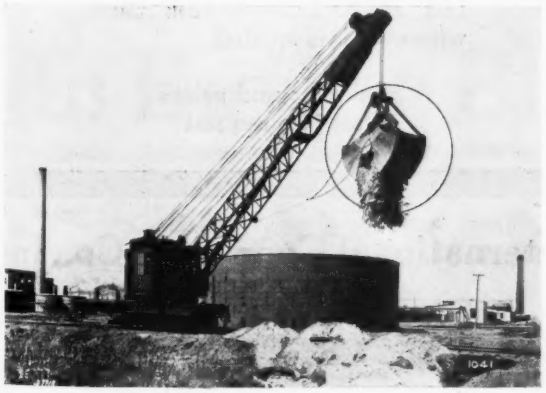
"I would not have believed that we could do the work that this "A" ERIE actually handles. It has given 50 per cent more than I expected. Besides, we have dug frozen sand and rock, without a thing going wrong with the machine."

Whether you need an output of 200 tons a day or 1,000 tons, you will be interested in a bulletin that shows just what ERIE Shovels can do for you. Write for Bulletin P-16.

Branch Offices:
NEW YORK
PITTSBURGH
BOSTON CHICAGO
Representatives throughout the U. S. A.

BALL ENGINE CO., Erie, Pa., U. S. A.
Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels — BALL Engine Co. Erie, Pa.



Clam Shell Buckets at Bargain Prices

We are offering a limited number of "Type 'R' Clam Shell Buckets" in 1½ and 2 cu. yd. sizes for immediate shipment at the exceptionally low prices of—

$725.00 F. O. B. Bedford, for the 1½ cu. yd. Bucket, weighing 4250 pounds and

$850.00 F. O. B. Bedford, for the 2 cu. yd. Bucket, weighing 4975 pounds.

These buckets are of the flat link power wheel type and are of heavy substantial construction.

This type of bucket is especially adapted to the handling of coal, limestone, sand, gravel and other similar materials.

If you wish to purchase a superior bucket at the above prices you must act quickly.

THE McMYLER INTERSTATE CO., Cleveland, Ohio

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San Francisco, Calif., 766 Folsom Street
New Orleans, La., 444 Maison Blanche Annex
Birmingham, Ala., Brown-Marx Building
Boston, Mass., 261 Franklin Street

AUSTIN GYRATORY CRUSHERS

Stationary and Portable Types—Efficient —Economical—Reliable

The Gyratory type of Crusher has numerous features of proven worth.

The Austin has six features not found in any other Gyratory Crusher.

Catalog 28-T should be in the hands of every one interested in Crushers. Write for your copy today.

AUSTIN MANUFACTURING CO.
New York Chicago San Francisco

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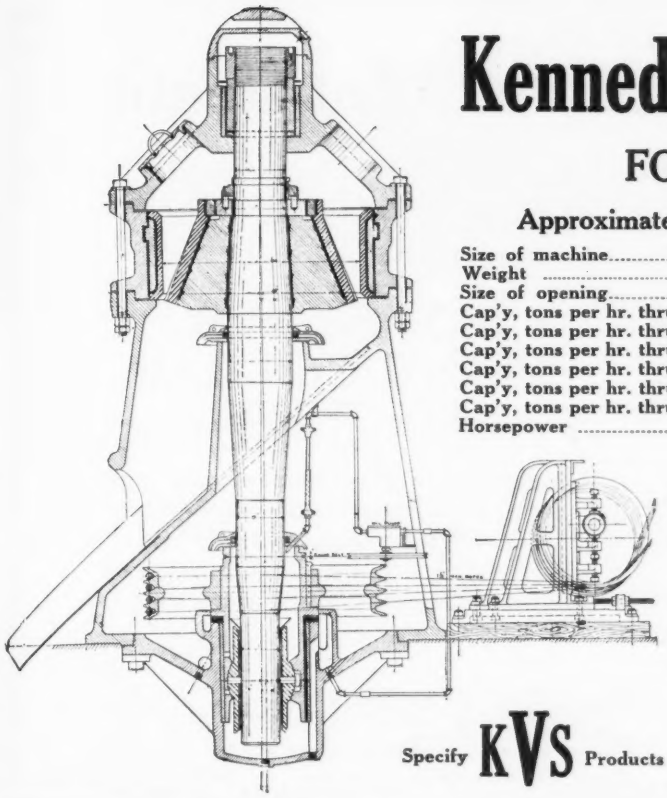


Kennedy Gearless Crusher

FOR FINE GRINDING

Approximate Dimensions, Capacity and Horsepower

	No. 25	No. 37	No. 49
Size of machine			
Weight	15,000 lbs.	30,000 lbs.	70,000 lbs.
Size of opening	5½"	7"	12½"
Cap'y, tons per hr. thru ½" ring	12 to 20	.....	.....
Cap'y, tons per hr. thru ¾" ring	18 to 25	25 to 40	.....
Cap'y, tons per hr. thru 1 " ring	20 to 30	30 to 45	50 to 70
Cap'y, tons per hr. thru 1½" ring	25 to 35	45 to 70	65 to 100
Cap'y, tons per hr. thru 2 " ring	.....	50 to 100	80 to 125
Cap'y, tons per hr. thru 2½" ring	.....	.....	100 to 150
Horsepower	15 to 20	20 to 30	40 to 60

We carry these machines in stock for prompt shipment and guarantee capacities.

They may be driven by belt or rope by use of our patented universal guides.

They can be set in any position.

If interested, write or wire our expense for full particulars. If necessary, our engineer will call and show how to install same. One concern is getting more fine stone from a No. 37 than they did from 4 No. 5 Geared Crushers.

Kennedy Van Saun Mfg. & Eng. Corp.
120 Broadway, New York
40, Rue des Mathurins, Paris

Specify KVS Products

Cement mill doubles clinker output

by increasing crushing capacity one-third and screening with Hum-mer *Electric* Screens

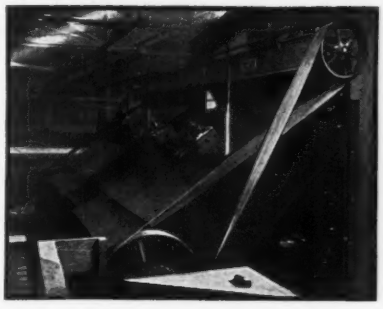
THE Castalia Portland Cement Co. formerly fed the product of their ball mills directly to tube mills.

Two years ago, by increasing their clinker crushing capacity one-third and screening the clinker with HUM-MER *Electric* Screens after it had gone through the preliminary crushers, they increased the volume of this process 100% and are now operating on a 12-hour basis instead of 24.

Furthermore, the HUM-MERS produced a finer and more uniform product for the tube mills with the result that the tube mills work 60 to 70% faster—and a higher quality of cement is produced.

Mr. Kirkpatrick, superintendent, states that the labor saved by eliminating the 12-hour night shift alone pays for the HUM-MER installation twice a year.

Send for detailed copy of Castalia Portland Cement Co. HUM-MER Report.



HUM-MER *Electric* SCREENS
Castalia Portland Cement Co.
Castalia, Ohio.

THE W. S. TYLER COMPANY, *Cleveland, O.*

Manufacturers of Woven Wire Screens and Screening Equipment

Buyers' Guide of the Rock Products Industry

Classified Directory of Advertisers in Rock Products

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New York, N. Y.

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Bates Valve Bag Co.
Chicago, Ill.
Jaite Co., The
Jaite, Ohio
Valve Bag Co. of America
Toledo, Ohio

Barrels, Lime
International Cooperage Co.
Niagara Falls, N. Y.
Sandusky Cooperage & Lbr. Co.
Toledo, Ohio.

Belting
Cincinnati Rubber Mfg. Co.
Cincinnati, Ohio
New York Belting & Packing Co.
New York, N. Y.

Blasting Supplies
Du Pont de Nemours & Co., E. I.
Wilmington, Del.
Grasselli Powder Co.
Cleveland, Ohio.

Brick Machinery
Shope Brick Co.
Portland, Ore.

Buckets, Elevator
Hendrick Mfg. Co.
Carbondale, Pa.
Orton & Steinbrenner
Chicago, Ill.

Buckets
Blaw-Knox Co.
Pittsburgh, Pa.
Browning Co.
Cleveland, Ohio.
McMyler Interstate Co.
Cleveland, Ohio.
Owen Bucket Co.
Cleveland, Ohio.

Cableways
Blaw-Knox Co.
Pittsburgh, Pa.
S. Flory Mfg. Co.
Bangor, Pa.
Interstate Equip. Co.
New York, N. Y.

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Atlas Car & Mfg. Co.
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Butterworth & Lowe
Grand Rapids, Mich.

Cars, Quarry and Industrial
Atlas Car & Mfg. Co.
Cleveland, Ohio.
Easton Car & Constr. Co.
Easton, Pa.
Watt Mining Car Wheel Co.
Barnesville, Ohio.

Cement Machinery
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

Cement Mill Repairs
Taylor-Wharton Iron & Steel Co.
High Bridge, N. J.

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Caldwell, H. W., & Son Co.
Chicago, Ill.
Jeffrey Mfg. Co., The
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Link Belt Co.
Chicago, Ill.
Smith Eng. Works
Milwaukee, Wis.
Stephens-Adamson Mfg. Co.
Aurora, Ill.
Sturtevant Mill Co.
Boston, Mass.
Universal Road Mach. Co.
Kingston, N. Y.

Cranes—Locomotive Gantry
Ball Engine Co.
Erie, Pa.
Byers Mach. Co., The
Ravenna, Ohio
McMyler-Interstate Co.
Cleveland, Ohio.
Ohio Locomotive Crane Co.
Bucyrus, Ohio.
Orton & Steinbrenner
Chicago, Ill.
Osgood Co., The
Marion, Ohio.

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Allis-Chalmers Mfg. Co.
Milwaukee, Wis.
Austin Mfg. Co.
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Buchanan Co., Inc., C. G.
New York, N. Y.
Butterworth & Lowe
Grand Rapids, Mich.
Chalmers & Williams
Chicago Heights, Ill.
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Fullerton, Pa.
Jeffrey Mfg. Co., The
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K. B. Pulverizer Co.
New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp.
New York, N. Y.
Kent Mill Co.
Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co.
Lewistown, Pa.
McLanahan-Stone Mach. Co.
Hollidaysburg, Pa.
Munson Mill Machinery Co.
Utica, N. Y.
New Holland Machine Co.
New Holland, Pa.
Pennsylvania Crusher Co.
Philadelphia, Pa.
Raymond Bros. Impact Pulverizer Co.
Chicago, Ill.
Smidth & Co., F. L.
New York, N. Y.
Smith Eng. Works
Milwaukee, Wis.
Sturtevant Mill Co.
Boston, Mass.
Traylor Eng. & Mfg. Co.
Allentown, Pa.
Universal Road Mach. Co.
Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co.
Chicago, Ill.

Crusher Feeder
Maddox Fdy. & Mchy. Co.
Archer, Fla.

Crusher Repairs—Manganese Steel
Taylor-Wharton Iron & Steel Co.
High Bridge, N. J.

Derricks
Terry Mfg. Co.
New York, N. Y.

Dipper Teeth
American Manganese Steel Co.
Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co.
High Bridge, N. J.

Drills
The Loomis Machine Co.
Tiffin, Ohio.
Sanderson Cyclone Drill Co.
Orrville, Ohio.
Wood Drill Works
Paterson, N. J.

Drillers
Pennsylvania Drilling Co.
Pittsburgh, Pa.

Dryers
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New York City.
Vulcan Iron Works
Wilkes-Barre, Pa.

Dust Collecting Systems
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

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Du Pont de Nemours & Co., E. I.
Wilmington, Del.
Grasselli Powder Co.
Cleveland, Ohio.

Engines, Steam
Morris Mach. Works
Baldwinsville, N. Y.

Engineers
Arnold & Weigel
Woodville, Ohio.
Bacon, Earle C., Inc.
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Buckbee Co., J.C.
Chicago, Ill.
Fuller Engineering Co.
Allentown, Pa.
James N. Hatch
Chicago, Ill.
R. W. Hunt & Co.
Chicago, Ill.
Little, Inc., Arthur D.
Washington, D. C.
Randolph-Perkins Co.
Chicago, Ill.
Smidth & Co., F. L.
New York, N. Y.
Schaffer Eng. & Equip. Co.
Pittsburgh, Pa.

Excavators
Ball Engine Co.
Erie, Pa.
Owen Bucket Co.
Cleveland, Ohio.

Excavators—Dragline Cableway
Link-Belt Co.
Chicago, Ill.
Sauerman Bros.
Chicago, Ill.

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Wilmington, Del.
Graselli Powder Co.
Cleveland, Ohio.

Fuses
Ensign-Bickford Co.
Simsbury, Conn.

Gas Producers
Morgan Construction Co.
Worcester, Mass.

Gears
Caldwell, H. W., & Son Co.
Chicago, Ill.
Plamondon Mfg. Co.
Chicago, Ill.

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(Continued from page 66)

Generators
Sorgel Electric Co.
Milwaukee, Wis.

Glass Sand Equipment
Lewistown Fdy. & Mach. Co.
Lewistown, Pa.

Grates
The Kramer Bros. Fdy. Co.
Dayton, Ohio.

Grinding Mills
Munson Mill Machinery Co.
Utica, N. Y.

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Flory Mfg. Co., S.
Bangor, Pa.
Vulcan Iron Works
Wilkes-Barre, Pa.

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Cincinnati, Ohio.
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Miscampbell, H.
Duluth, Minn.
Schaffer Eng. & Equip. Co.
Pittsburgh, Pa.
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Milwaukee, Wis.

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Morris Machine Works
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Woodville, Ohio.
Glamorgan Pipe & Fdy. Co.
Lynchburg, Va.
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York, Pa.
Vulcan Iron Works
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Erie, Pa.
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Columbus, Ohio.

Locomotives
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Bucyrus, Ohio.
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Carbondale, Pa.
Jeffrey Mfg. Co., The
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Tyler Co., The W. S.
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Raymond Bros. Impact Pulv. Co.
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Boston, Mass.
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Cleveland, Ohio.

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Tyler Co., The W. S.
Cleveland, Ohio.

Buyers' Bulletin

MANUFACTURERS OF MACHINERY AND EQUIPMENT:—These inquiries are live, up-to-date inquiries that have come direct to us from the individual in each case.

READERS OF "ROCK PRODUCTS":—This Department is for your special help and service. If you do not see what you require advertised in "Rock Products," tell us your needs and we will publish them here. There is no charge for this service.

Westminister Sand & Gravel Co., Box 518, Lima, Ohio, want catalogs on rock crushers, bucket elevators, sand screens and scrubbers.

Hodgson Sand & Gravel Co., Stanhope, N. J., want information and prices on grizzly bars.

Menantico Sand & Gravel Co., Box 34, Millville, N. J., write us as follows: "Please give us a list of concerns making the following: Revolving screen 48" dia. by 18' 0" long with 72" dust jacket, 12' 0" long. First 12' of screen to have 1" perforations and last 6' to have 2" perforations. Dust jacket to have 3/8" slotted perforations."

J. H. Beeks, Sundale, Wash., writes that he has a large deposit of silica and would like catalogs and information concerning equipment to develop same.

Tatesville Silica Sand Co., Everett, Pa., advise that they want to figure on a washing plant or add a washer to their plant and desire manufacturers of this equipment to communicate with them.

Queenston Quarries, Ltd., St. Davids, Ont., Canada, write us as follows: "We would like to receive particulars as to the plant required and approximate cost for reducing our stone screenings to flour, also the best process for screening and drying same. We estimate our requirements to be from 25 to 50 tons per day."

INDEX TO ADVERTISEMENTS

You can use the new low-freezing DU PONT STRAIGHT DYNAMITE in any weather without thawing

"This powder gave us excellent results.....as we found it was the only powder we had during the past winter, and especially during zero weather, which we did not have to thaw, it being in perfect condition at all times when we took it out of our large unheated magazine .....this is the type of powder we have long looked for."

(Excerpt from letter from a large user of explosives)

THE quick action, great shattering power and reliability of Du Pont Straight Dynamite has made it for many years the standard for many kinds of work. The new low-freezing Du Pont Straight, the result of years of work by Du Pont Chemical Engineers, retains all the finer qualities of the old "Straight" without its great disadvantage—high freezing point, requiring a time-wasting and dangerous thawing operation. The new Du Pont Straight can be used successfully without thawing in any weather. It is indeed "the type of powder we have long looked for."

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San Francisco, Calif.
Scranton, Pa.
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Springfield, Ill.

Du Pont Products Exhibit
Atlantic City, N. J.

E. I. du Pont de Nemours & Co., Inc.
Explosives Department
Wilmington, Delaware

EXPLOSIVES ~ SERVICE